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South Australia.

DEPARTMENT OF MINES.

MINING REVIEW

FOR THE

HALF-YEAR ENDED DECEMBER 31st, 1920.

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Compiled by LIONEL C. E. GEE, S.M., Chief Registrar and Recorder, Department of Mines.

ISSUED UNDER THE AUTHORITY OF THE

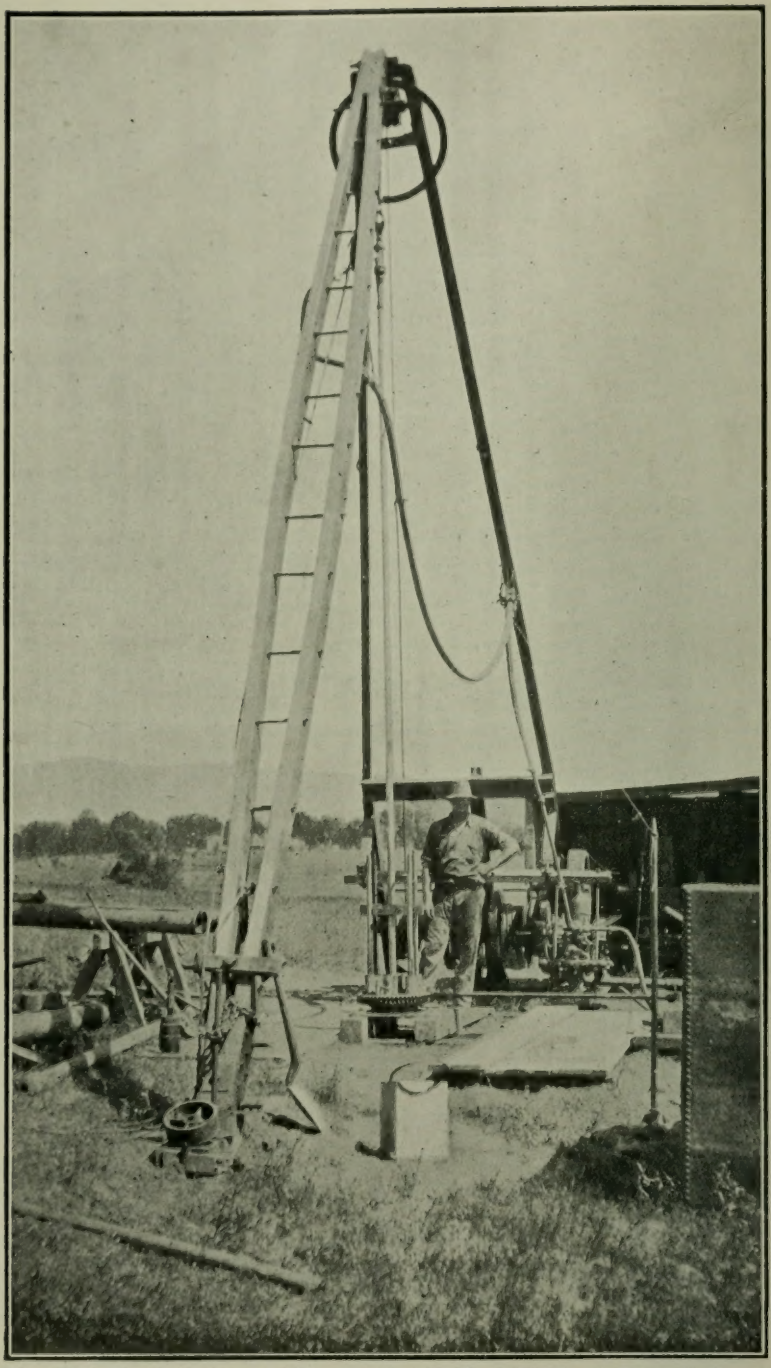
HONORABLE T. PASCOE, M.L.C.,

Minister of Mines.

DEPARTMENT OF GEOLOGICAL SCIENCES
UNIVERSITY OF TORONTO

Adelaide:
R. E. E. ROGERS, GOVERNMENT PRINTER, NORTH TERRACE.

1921.



The Victoria Rotative and Percussive Drill at Work at Hope Valley.

Frontispiece.]

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MINER'S RIGHTS AND PRIVILEGES THEREUNDER.

A miner's right is obtainable at the Department of Mines, Adelaide, also at the issuing stations in the various mining districts, at a cost of 5s.; it is in force for one year from the date of issue, and may be renewed at any time during its currency for another term of one year on payment of 5s. The holder is authorised to prospect on any mineral lands for any metal, mineral, coal, or oil, and to peg out (of the prescribed shape and dimensions) gold, precious stones, mineral, coal, and oil claims, and also obtain leases, as detailed below.

AREAS AND WORKING CONDITIONS.

GOLD LEASES—Maximum area, 20 acres; working conditions, one man to every five acres.

MINERAL LEASES—40 acres; one man to every 10 acres.

MISCELLANEOUS LEASES—

Salt	640 acres;	special conditions.
Gypsum	640 "	"
Mining Works	10 "	one man.
COAL OR OIL LEASES	640 "	one man to every 40 acres.
GOLD DREDGING LEASES	200 "	special conditions.
MINERAL CLAIMS	40 "	
GOLD CLAIMS	30ft. x 30ft., alluvial;	100ft. x 600ft., reef.
PRECIOUS STONES CLAIMS	150ft. x 150ft.	

Gold and Precious Stones claims must be constantly worked—one man for each claim—mineral claimholders must employ two men for each claim. Coal or oil claims, eight men. Amalgamation of gold (reef), mineral, coal, or oil claims reduces the labor conditions by one-half until payable results have been obtained.

Gold, mineral, coal, and oil leases are granted for a term not exceeding 21 years—the two former at a rental of 1s. per acre per annum and a royalty of 6d. in the pound on net profits, the latter at a rental of 6d. per acre per annum until coal or oil is found in payable quantities, when 1s. per acre is payable and a royalty of 6d. in the pound on the net profits.

The Minister may permit, for the concentration of labor, of the amalgamation of not more than four adjoining gold or mineral leases.

Any number of gold (reef), mineral, coal, or oil leases may be held by one person.

Licences to search for twelve months for precious stones, mineral phosphates, oil, rare metals, minerals, and earths are issued on specific mineral lands, not exceeding five square miles in area for one person, a fee of 20s. being charged for each square mile or portion thereof. The licences for mineral phosphates, oil and rare metals, minerals and earths give a preferential right to a lease over a portion of the area, as prescribed, and in case of a licence to search for precious stones, to a precious stones claim not exceeding the prescribed area.

MINING ON PRIVATE PROPERTY.

The Mining on Private Property Act of 1909 and the amending Act of 1916 apply only to land, the metals, minerals, precious stones, metalliferous ores, coal, shale, oil, salt, or gypsum on or under which are alienated from the Crown in fee simple.

Prior to 1886 all metals, minerals, &c., were sold with the land (these lands are defined as " Private land " in the Acts), but since 1886 gold, and since 1888 all the metals and minerals in lands sold by the Government are reserved to the Crown and can be dealt with under the Mining Act of 1893.

All arrangements for entry and for mining on private land can be made, if feasible, between the prospector and the owner of the freehold without reference to the Mining on Private Property Acts, *save that a copy of any agreement made must be forwarded without delay to the Mines Office, and six monthly returns giving full details of the mining operations must be furnished.*

The procedure necessary under the Acts is now according to the following summary :—

(1) The prospector will obtain a miner's right.

(2) He will apply for a written authority to enter and peg out from the Minister, or a warden, or mining registrar ; to obtain which it is necessary for him to lodge at the Mines Office a statutory declaration made before a Justice to the effect that there are reasonable grounds, which must be shortly stated, for supposing the land to be mineral bearing ; also a plan showing the land referred to, and a deposit of a sum of money as security against any possible damage done by him during the fourteen (14) days allowed for preliminary prospecting. In connection with the deposit required, the amount should, if possible, be arranged between the applicant and the owner of the land ; but if at the expiration of seven (7) days after an application in this behalf has been made by the applicant to the owner, the amount cannot be agreed upon, the amount of the deposit will be assessed by the department.

(3) On receiving the authority, before actually entering upon the private land, three (3) clear days' notice in writing must be given to the owner and occupier.

(4) The authority entitles the prospector to prospect between the hours of 6 a.m. and 6 p.m. for a period not exceeding fourteen (14) days on an area not exceeding one square mile ; also to make trenches and sink holes, provided that the area of the surface broken by such operations does not exceed 100 square feet. The prospector may also remove samples not exceeding 28lbs. in weight.

(5) If he is satisfied he may peg out the area which he desires to have included in a claim or lease.

(6) The prospector then endeavors to make a private arrangement with the owner of the property for the working of the mineral deposit.

(7) If, after the expiry of one month, he fails to arrive at a satisfactory agree, ment with the owner, he can apply for a compulsory mining lease.

(8) On the granting of such lease the work of mining or actually raising ore for sale can be commenced.

The right formerly possessed by the owner of the land to work the property himself within a period of two months by complying with the necessary working conditions no longer exists.

NOTES FOR OPAL MINERS.

Every miner must have a miner's right. The fee is 5s. per annum, and they are obtainable at the Adelaide Mines Office, Tarcoola, Port Augusta, Beltana, Hergott (Marree), and Oodnadatta Police Stations, and from Mr. J. W. Duck, Leigh Creek (Copley).

A miner's right may be issued to any " person "—that is, any individual above the age of 16 years. This right forms the basis of all operations under the Mining Acts. Without it a person has no protection, cannot legally prospect or mine, or peg out a claim, and, moreover, is liable to a penalty of £1 per day for unlawfully prospecting and mining.

The holder is authorised to prospect for any metal, mineral, precious stones, coal, or oil, the property of the Crown, with the right of possession when found. It is the authority for pegging out a claim and also to occupy for residence a quarter of an acre of land, from which the holder has the right to remove any buildings erected by him, and he may cut and use timber from Crown lands for his own mining and domestic purposes. Each claim must be represented by a miner's right, and it must be noted that no person can hold more than *one* precious stones claim at the same time.

The area allowed for a precious stones claim is 150ft. by 150ft., and is to be pegged out in the following way :—Four pegs are to be securely placed in the ground to mark the four corners. Each peg must be not less than 3in. thick and project not less than 3ft. above the surface of the ground, and have clearly marked on it the number of the miner's right and the date of pegging. From each peg two trenches must be cut in the ground not less than 3ft. long, 1ft. wide, and 6in. deep, pointing in the directions of the boundary lines of which the peg forms the corner. In rocky ground stone direction piles may be made instead of the trenches. All these marks must be maintained in position while the claim is held, or the claim will be liable to forfeiture. When pegging out ground adjoining another claim a wall 3ft. wide must be left between the claims. The working conditions are one man to be kept constantly employed for each precious stones claim. Constantly employed means eight hours for five working days of the week and four hours for Saturday. Claims can be held for 30 days without registration, and under exceptional circumstances this period may be extended for a further 14 days. The registration must be made at the Adelaide Office, and the form of application is simple and readily obtainable. It must show name and address of applicant, number of miner's right, nature of claim, locality, and sketch showing position. The miner's right must be attached to the application and a fee of 2s. 6d. paid. The certificate of registration is then issued from the Adelaide Office, and the miner's right returned to the applicant with the registered number marked thereon. Care must be taken that the miner's right, by virtue of which the claim is held, is kept valid by renewal at the proper time and not allowed to lapse, otherwise the certificate will become void and the title to the ground lapses.

Every holder of a claim is protected—

(*a*) While he is incapacitated from work by illness ;
(*b*) Absent on urgent business ;
(*c*) In attendance at a court of law ;
(*d*) During the continuance of floods or droughts ;
(*e*) While he is engaged upon work in public or national interest ;
(*f*) During public holidays ; and
(*g*) During 14 days commencing on the 22nd December.

The onus of proof of good cause for absence lies on the claimholder. Notices should be placed on the claim and also forwarded to the Mines Office, Adelaide.

SEARCH LICENCES.

The Mining Amendment Act (No. 751 of 1900, also amended by Act 1054 of 1911), allows the granting of licences to search on any specific mineral lands, not exceeding five square miles in area, for:—

(*a*) Precious stones:

(*b*) Mineral phosphates:

(*c*) Oil:

(*d*) Rare metals, minerals, and earths, the mining for which, in the opinion of the Minister, has not been proved payable in any instance in any portion of the State.

The applicant must be the holder of a miner's right, and, in addition, the fee payable is £1 for each square mile or portion thereof.

No person shall directly or indirectly hold more than five square miles of land at one time under search licence.

Lands held under miner's rights or mining leases are exempt from search licences.

The licence is in force for 12 months from the date thereof, and authorises the licencee, his assigns, servants, and workmen—

To search and mine the land comprised in the licence for the mineral as specified therein:

To remove not exceeding 20 tons in the whole for testing purposes only.

The duties of the licencee are to employ, and keep constantly employed from the expiration of three months after the granting of the licence during the remainder of the term of the licence, not less than one man in searching for the mineral specified in the licence for every 640 acres or portion thereof granted under licence, but the Minister has power to grant an exemption, or partial exemption, for a period not exceeding three months on payment of the fee prescribed for the suspension of a lease (£1).

To furnish the Minister whenever required by him with satisfactory evidence of compliance with this provision.

To report to the Minister forthwith after the discovery in payable quantities of the mineral specified in the licence. In default of compliance with these provisions licence to be forfeited.

Licencees, during the currency of their licences, have preferential rights over any part of the land comprised in the licence, as follows:—

Rare metals, minerals, or earths, to a mineral lease not exceeding 40 acres.

Mineral phosphates—To a mineral lease not exceeding 100 acres.

Oil—To a lease not exceeding 640 acres.

Precious stones—To a precious stone claim of not exceeding the prescribed area (150ft. by 150ft.).

Upon the preferential right being exercised the licence ceases.

Persons holding miner's rights can prospect on and register and acquire claims and leases for gold, silver, lead, or copper, on any lands comprised in a search licence.

PREFACE.

THE total value of the mineral production of South Australia for the year 1920 shows a very satisfactory advance beyond the figures for 1919. The principal factors in the achievement of this result were iron ore, copper, and salt. The value of the iron ore raised during 1920 is greater than that won in any preceding year, and it is anticipated that a yet larger tonnage will be produced during 1921.

The copper production for 1920 was materially greater than that for 1919, but did not regain the first place from which, for the first time in the history of South Australian mining, it was displaced in 1919.

The total value of the salt produced has only been exceeded on one previous occasion, and the tonnage of phosphate rock recovered has never been so large.

The opal miners at Stuart's Range played an important part in augmenting the production, and there has been a steady increase in the sale of barytes and gypsum from South Australian sources.

L. KEITH WARD,
Director of Mines.

March 31st, 1921.

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DECENNIAL RETURN SHOWING, SO FAR AS CAN BE ASCERTAINED PRODUCED IN

	1911.		1912.		1913.		1914.		1915.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£
Gold	3,531	15,000	6,592	28,000	6,545	27,800	6,258	26,58	6,081	25,830
Silver	1,400	140	2,700	326	2,650	300	3,006	314	2,462	277
Silver Lead Ore	—	—	—	—	Tons 153	1,100	Tons 18	215	Tons 59	625
	cwts.		cwts.		cwts.		cwts		cwts.	
Copper	118,440	332,500	125,900	461,500	143,222	488,986	137,614	417,487	154,506	561,247
Lead	—	—	—	—	—	—	—	—	—	—
	Tons		Tons		Tons		Tons		Tons	
Ironstone	42,300	26,400	42,200	26,375	60,658	37,911	42,622	37,137	237,375	264,612
Manganese Ore	—	—	—	—	—	—	—	—	250	563
Molybdenite	—	—	—	—	—	—	—	—	—	—
	cwts.		cwts.		cwts.		cwts.		cwts.	
Wolfram Ore	40	154	5	20	2½	10	6	24	5	35
Radium and Radio Active Material (Uranium Ore)	—	—	—	—	—	3,620	—	5,215	—	—
Asbestos	—	—	—	—	—	—	—	—	7	5
							Tons			
Alunite	—	—	—	—	—	—	20	40	—	—
	Tons		Tons		Tons				Tons	
Barytes	—	—	—	—	103	320	500	1,680	290	1,320
Bluestone	181	4,163	102	2,550	13	325	—	—	3	69
Talc	100	200	120	600	50	250	—	—	—	—
Felspar	—	—	—	—	—	—	—	—	—	—
Fireclay and Pipeclay	1,463	169	200	150	320	240	1,223	917	7,165	5,374
Gypsum	9,700	7,275	12,000	9,00	7,150	5,362	16,276	12 207	19,900	17,413
Kaolin	—	—	—	—	—	—	10,239	16,382	1,209	1,934
Limestone	28,700	7,175	50,600	12,500	44.300	11,075	54,054	16,892	71,723	22,413
Magnesite	—	—	—	—	—	—	—	—	80	160
Mica	—	—	—	—	—	—	—	—	—	—
Ochre (crude)	105	105	300	300	250	250	84	84	28	28
Opal	—	—	—	—	—	—	—	—	—	—
Pebbles, Flint	458	856	120	420	514	1,799	270	829	385	1,023
Phosphate Rock	5,800	5,800	6,100	6,100	5,950	6,545	6,083	6,691	4,614	5,536
Pyrites	2,496	2,560	-	—	—	—	—	—	—	—
Salt (crude)	65,000	40,600	64,300	40,187	65,000	48,750	65,000	48,750	64.000	80,000
Sulphuric Acid	4,626	6,940	5,095	7,642	5,602	7,983	5,940	8,910	5,965	13,421
Soapstone	—	—	—	—	—	—	—	—	—	—
£	—	450,037	—	595,670	—	642,626	—	600,355	—	1,001,885

OUTPUT AND VALUE OF THE VARIOUS METALS AND MINERALS SOUTH AUSTRALIA.

1916.		1917.		1918.		1919.		1920.		1911-1920.	
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Total Output.	Total Value.
ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£
7,769	33,000	7,141	30,334	6,180	26,252	3,224	13,696	1,697	7,209	55,018	233,702
3.427	514	1,825	333	1,608	331	561	180	1,005	226	20,644	2,941
Tons 243	4,659	Tons 622	12,018	Tons 503	10,161	Tons —	—	Tons 82	2,420	Tons 1,680	31,198
cwts. 145,580	822,527	cwts. 144,262	902,495	cwts. 143,378	828,556	cwts. 50,335	228,930	cwts. 86,784	423,601	cwts. 1,250,021	5,467,829
—	—	—	—	—	—	—	—	—	—	—	—
Tons 188,329	200,382	Tons 328,386	359.723	Tons 257,029	277,279	Tons 268,530	307,402	Tons 413,038	478,436	Tons 1,180.467	2,015,657
544	2,700	264	1,597	1,080	17,876	298	1,490	514	4,626	2,950	28,852
—	—	cwts. 18½	359	cwts. 4½	98	cwts. 3½	70	—	—	T. c. 1 6½	527
cwts. 4	28	4	30	—	—	—	—	—	—	3 6½	301
—	—	—	—	—	686	—	—	—	—	—	9,521
Tons 21	210	—	—	—	—	—	—	5	90	T. c. 26 7	305
134	670	Tons 29	145	—	—	Tons 60	246	20	15 0	Tons 263	1,251
456	2,052	790	2,370	Tons 1,352	4,059	1,753	5,264	2,542	7,362	7,846	24,427
—	—	—	—	—	—	—	—	—	—	299	7,107
103	309	—	—	235	453	224	785	98	714	930	3,311
—	—	—	—	—	—	—	—	4	8	4	8
1,605	1,204	1,874	1,405	1,501	710	3,405	1,080	42	8	18,798	11,257
20,371	17,825	12,776	11,179	32,013	28,012	25,216	18,725	40,192	31,604	195,594	158,602
1,635	2,616	1,967	3,442	2,513	4,888	777	1,463	693	1,287	19,033	32,012
74 641	23,325	68,464	21,395	72,209	34,813	45,398	15,994	30,508	9,538	540,597	175,120
166	332	150	300	440	666	273	508	185	347	1,294	2,313
—	—	37½	337	—	—	—	—	-	—	37½	337
40	80	78	156	30	60	146	939	260	1,131	1,321	3,133
—	750	—	500	—	7,175	—	20,000	—	24,000	—	52,425
158	474	1,217	3,956	2,816	11,849	1,243	4,708	423	1,604	7,604	27,518
5,013	5,839	5,101	6,064	8,074	10,773	5,950	8,982	8,753	12,309	61,438	74,639
—	—	—	—	—	—	—	—	—	—	2 496	2,560
66,400	83,000	46,858	93,716	88,519	177,038	69,174	138,348	70,871	141.742	665,122	892,131
6,919	10,378	6,190	8,820	6,746	9,613	2,179	3,105	4,372	6,230	53,634	83,042
—	—	—	—	75	150	40	80	100	100	215	330
—	1,212,874	—	1,460,674	—	1,451,498	—	771,995	—	1,154,742	—	9,342,356

MINING OPERATIONS DURING THE HALF-YEAR ENDING DECEMBER 31st, 1920.

AREA AT PRESENT HELD UNDER MINING ACTS (DECEMBER 31ST, 1920).

Nature of Holding.	Number.	Area.
Mineral leases	294	13,545 acres
Gold leases	41	748 "
Miscellaneous leases	105	22,692 "
Coal and oil leases	26	16,640 "
Mineral claims	401	15,796 "
Occupation licences	203	101½ "
Search licences	192	381,440 "
Coal and oil claims	238	152,320 "
Gold claims	3	10 "
Precious stones claims	11	5 "
Total holdings	1,514	603,297½ acres

REGISTERED FROM JUNE 30TH, 1920, TO DECEMBER 31ST, 1920.

Miscellaneous leases	4	343 acres
Mineral leases	1	40 "
Gold leases	3	37 "
Mineral claims	208	8,320 "
Coal and oil claims	67	42,880 "
Occupation licences	3	1½ "
Search licences	115	224,000 "
Miners' rights	1,152	—
Precious stones claims	3	1½ "
Coal leases	6	3,840 "
Total	1,562	279,463 acres

MEN EMPLOYED.

Estimated number of men employed in mining and mineral works during the period under review :—

Copper	1,250
Salt and Gypsum	530
Other minerals	1,000
Smelting works, etc.	1,000
Total	3,880

GENERAL NOTES.

Reports as under, will be found :—

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Iron Knob and Hummock Hill 80

Broken Hill Associated Smelters 80

Mount Crystal Barytes Mine 80

Quarries 80

The average price of copper per ton in London during the six months has been—

	£	*s.*	*d.*
Standard	89	4	3
Best selected	99	17	7
Electrolytic	104	7	2

For the whole of year 1920—

	£	*s.*	*d.*
Standard	97	12	4½
Best selected	107	11	9
Electrolytic	110	10	0

The average price of standard for the last ten years is £87 11s. 7d.

At the Wallaroo and Moonta Mines 86,045 tons of lode material have been broken; 78,972 tons treated, producing 2,457 tons of copper. One thousand two hundred and eleven hands were employed on the mines and 280 at the smelting works, making a total of 1,491 hands.

From the *Dome Rock Copper Mine*, near Boolcoomatta, 86 tons of 18.96 per cent. copper ore have been marketed, and a considerable amount of both surface and underground work done.

A little copper mining has been done at the following places:—*North*—Breaden Hill, Barilla, Belliak, Blinman, Diamond Jubilee, Jubilee Extended, Kapunda, Leslie's Well, Mount Fitton South, Nichols' Nob, Nuccaleena, Paull's, Yudnamutana. *North-East*—Lovely Gully, Mutooroo. *South*—Kanappa. *Yorke Peninsula*—North-East Matta, Poona, Hicks and Hooper, Wallis and party.

From the statutory returns received, the total mineral production of the State for the year 1920 may safely be put down at £1,154,742; for 1919 the total value was £771,995; and the large increase shown, the figures being in advance of those of 1916, 1917, and 1918, when the average price of standard copper was much higher, is decidedly satisfactory. Copper, ironstone, and salt loom largely in the list, and had it not been for the unfortunate industrial troubles, the production of ironstone, clay, limestone flux, and various other minerals would have shown much larger totals. No ironstone was forwarded from Iron Knob to the Port Pirie smelters of the Broken Hill Associated Company; the limestone flux deposits of Wardang Island and Point Turton were unworked; as also were the clay beds between Hummock Hill and Iron Knob.

The fall in the metal market has, of course, had a great effect on the prospecting of the Eukaby silver-lead shows near Baratta (detail report will be found at page 53). A considerable amount of prospecting work has been done, and from three mineral claims held by the Baratta Silver-Lead Mines, 65 tons of ore were raised and and 33½ tons marketed, for a return of 21 tons lead and 1,039ozs. of silver, viz., 61 per cent. lead and 31ozs. silver per ton.

A report of Government drilling operations of special interest in connection with the lignite deposit at Paradise will be found at page 24, and the Chief Inspector's report on the deposits near Moorlands at page 66.

The Mines and Works Inspection Act, No. 1444 *of* 1920.—The inspection of mines and quarries was formerly carried out under the provisions of the Mining Act of 1893. This is essentially an Act dealing with tenure and ordinary mining business, and the matter of inspection of mines from the point of view of the safety and welfare of those engaged therein was dealt with in a few sections, briefly and inadequately. The definition of "mine" did not include quarries, and when it was found necessary to provide for the inspection of quarries, a short Act (No. 858 of 1904) had to be passed.

This was later found to be inadequate, and another Act (No. 1410 of 1919) had to be passed. Powers of inspection and power to make regulations were limited, and the method of ensuring compliance with the regulations was unsatisfactory.

The general practice at the present time is to withdraw all matters concerning the inspection of mines from the principal Act, and to include them in a special Act which deals with the inspection and safe conduct of mining operations only.

This has been done in the present case, and the new Act, modelled on the best practice in other States and countries, deals solely with the inspection of mines, quarries, and treatment plants, and all matters touching on these subjects have been removed from the principal Act.

Suitable definitions have been included by which all mines and quarries, metallurgical plants, treatment plants, and crushing plants, dealing with minerals, are brought within its scope.

The new Act is brief and concise, it consolidates and simplifies previous legislation, and is self-contained, needing no reference to any other Act.

The following proclamation by the Commonwealth Government is re-published for general information:—

[Extract from *Commonwealth of Australia Gazette*, No. 1, dated January 2nd, 1920.]

Prime Minister's Department,
January 2nd, 1920.

REWARD BY THE COMMONWEALTH GOVERNMENT FOR THE DISCOVERY OF PETROLEUM OIL IN COMMERCIAL QUANTITIES IN AUSTRALIA.

A reward of £10,000 will be paid by the Commonwealth Government for the discovery of petroleum oil in commercial quantities in Australia, subject to the following conditions:—

(1) Any person* who is engaged in boring for oil in Australia, and who desires to be considered as a possible claimant for the reward shall—

(*a*) within two months after this date, if he has already begun boring,

(*b*) within two weeks from the date of his commencing boring,

notify the Minister for Home and Territories in writing at his office in Melbourne. He shall at the same time furnish the following information:—

Precise locality of bore;

If any work done, a full statement relating thereto, including complete and technically correct daily records of strata passed through, sizes of casing and lengths of each size, particulars with regard to the striking of water, fresh, salt, or otherwise, mineralized, hot springs, showings of gas and oil.

*The word "person" includes person, firm, or company.

(2) He shall, at intervals of not less than one month from the date of above notification, send to the Minister for Home and Territories, and to the Minister for Mines in the State in which he is boring, a full report of all work done on or in connexion with the bore since last report.

(3) The Minister for Home and Territories, and the Minister for Mines for the State, or either of them, may authorise any officer to visit the bore, inspect all operations and records, examine all material extracted from the bore hole, satisfy himself that proper steps are being taken to insure maximum production and to prevent flooding by water of possible oil-bearing strata, examine storage tanks, take test samples at various depths, and make tests with standard apparatus to ascertain the quantity of water present.

Every facility shall be afforded by the claimant and his employees to such officer to make such investigations as he may deem fit.

(4) Should any oil-bearing strata be passed through in the course of boring operations, samples of the oil shall be taken, and not less than 2galls., free from water and other removable impurities, shall be sent to the Minister for Home and Territories and the Minister for Mines in sealed receptacles, with properly authenticated certificates as to the manner in which the oil was obtained.

(5) No payment of the reward shall be authorised unless it is proved to the satisfaction of the Minister that oil to the extent of 50,000galls. has been obtained, and that the bore is still flowing freely and producing oil in commercial quantities.

(6) If any dispute arises—

(*a*) as to who is entitled to the reward; or

(*b*) as to the manner in which the reward is to be distributed in cases where there are more claimants than one; or

(*c*) whether the conditions to be fulfilled in order to entitle the claimant to the reward have been fulfilled; or

(*d*) in any way concerning the claim to be a *bona fide* discoverer of oil in commercial quantities or for reward;

the Minister for Home and Territories may determine the dispute, and his decision shall be final and conclusive.

W. M. Hughes, Prime Minister.

Melbourne, September 9th, 1920.

Increase of Reward by Commonwealth Government for the Discovery of Petroleum Oil in Commercial Quantities in Australia.

It is hereby notified for general information that the reward of £10,000 offered by the Commonwealth Government for the discovery of petroleum oil in commercial quantities in Australia, the conditions in regard to which are contained in the *Commonwealth Gazette* of January 2nd, 1920, has been increased to £50,000.

W. M. Hughes, Prime Minister.

DEPARTMENT OF MINES.

THE NATIVE INDUSTRIES ENCOURAGEMENT ACT, 1872.

NOTICE OF THE OFFER OF A BONUS FOR THE DISCOVERY OF OIL.

Adelaide, April 8th, 1920.

A bonus of £5,000 is offered to the person or body corporate which first obtains from a bore or well situated in the State of South Australia 100,000galls. of crude petroleum, containing not less than 90 per cent. of products obtainable by distillation.

No application for a bonus will be considered unless the following conditions have been strictly complied with:—

1. The applicant for the bonus must have furnished to the Minister of Mines during the progress of drilling operations—

(*a*) A monthly record of work done;

(*b*) A full log of all bores and wells sunk, whether successful or unsuccessful;

(*c*) Samples of materials passed through by the bores, to be taken at every 50ft. sunk, and also at every change of country encountered;

(*d*) A declaration pursuant to "The Statutory Declarations Act, 1835," of the exact locality of each bore or well. (This should be furnished with the first monthly report on the bore or well.)

2. The oil must have been stored at the bore or well from which it has been obtained until the whole 100,000galls. has accumulated.

3. The applicant must furnish with his application—

(*a*) The certificate of a licensed surveyor nominated by the Minister of Mines as to the quantity of oil so stored;

(*b*) The certificate of the Government Analyst of the result of his analysis of samples of the oil taken by a person nominated by the Minister of Mines;

(*c*) A declaration pursuant to "The Statutory Declarations Act, 1835," that the whole of the oil for which the bonus is claimed was obtained from the bore or well where it is stored.

4. Within 24 hours of the first discovery of oil in the well or bore, notice of such discovery must be sent to the Minister of Mines.

5. Any person who desires at any time to inspect or test the well or bore on behalf of the Minister of Mines must be granted every facility for this purpose.

6. The applicant must have done nothing contrary to the provisions of "The Mining Act, 1893," or "The Mining Act Amendment Act, 1900," or of any lease or licence granted to the applicant under either of these Acts.

T. PASCOE, Minister of Mines.

DEPARTMENT OF MINES.

THE NATIVE INDUSTRIES ENCOURAGEMENT ACT, 1872.

NOTICE OF THE OFFER OF A BONUS FOR THE PRODUCTION OF GRAPHITE.

Office of the Minister for Mines, Adelaide, June 30th, 1920.

It is hereby notified that, pursuant to the powers conferred by the Act, No. 30 of 1872, and of all other powers in that behalf, a bonus will be paid by the Government on marketable graphite actually mined and prepared for market within the State of South Australia, on the following conditions, namely:—

1. The graphite shall be, in the opinion of an officer (hereinafter referred to as "the supervising officer") appointed by the Minister of Mines to supervise payments of bonuses under this notice, of good marketable quality as graphite.

2. The producer shall give notice in writing to the Department of Mines when he forwards any parcel of graphite on which a bonus is to be claimed, and shall give opportunity and authority for a Government officer to inspect the parcel before it is delivered finally to any manufacturer or consumer of graphite within the State, or is exported from the State. He shall also render an account for the bonus claimed on each parcel on a form provided by the Department, together with account sales showing all particulars and details of the actual sale of the parcel, and a declaration, made pursuant to the Statutory Declarations Act, 1915, that all information given concerning the parcel is true, and that the graphite is the produce of his mine within the State of South Australia.

3. The rate of the bonus will be proportionate to the carbon contents of the graphite. The maximum amount will be one pound (£1) per ton, which will be payable on graphite containing not less than eighty (80) per cent. of carbon. On graphite with a lesser percentage of carbon the bonus will be in proportion to the carbon content.

4. For the purpose of these conditions, the company or person or persons immediately controlling the working of the mine from which the graphite is raised shall be deemed to be the producer of the graphite, and any bonus payable shall be paid to such producer or to an agent authorised in writing by such producer. No bonus shall be payable to any seller intermediate between the producer and the final buyer.

5. The supervising officer, if not satisfied with the accuracy or the sufficiency of the information supplied concerning any parcel, may call for such further information as he may deem necessary, and the information so called for shall be supplied under statutory declaration as above mentioned.

6. The supervising officer's decision as to whether any, and (if any) what amount is payable by way of bonus on any parcel shall be absolutely final and conclusive.

7. The bonuses shall be payable on graphite sold and for which account sales are received by the Department of Mines on or before the 30th day of June, 1922.

N.B.—This notice supersedes the notice dated April 24th, 1917, contained in the *South Australian Government Gazette* of April 26th, 1917, and the notice dated March 13th, 1919, contained in the *South Australian Government Gazette* of May 8th, 1919, and the notices published in the *Mining Review,* Nos. 26 to 31, inclusive.

Mines Department, 276/1917. T. PASCOE, Minister of Mines.

SOUTH AUSTRALIAN ROOFING SLATES.

Offer of Bonuses.

The Government of the State of South Australia have directed that it be made known that it is their intention to offer bonuses to the producer or producers of roofing slates of best approved quality.. The slates must be the product of *bona fide* slate quarries situated within the State, and they must be approved by the Superintendent of Public Buildings or an officer nominated by him for the purpose.

This offer is made only in connection with the first 300,000 slates, and is limited to slates produced and approved as before mentioned within the term of two years from October 1st, 1919.

The bonuses offered are as follows:—£3 per thousand for the first 100,000, £2 per thousand for the second 100,000, and £1 per thousand for the third 100,000 of such slates—a possible total of £600.

Bonuses will not necessarily be paid exclusively to any one producer; for example, if of the first 100,000 slates half are produced by one and half by another producer, they will share equally in the first £300.

It is to be distinctly understood that no claim for any bonus will be recognised unless the slate is as good at least in quality as the standard sample now in the possession of the Superintendent of Public Buildings, which may be inspected by arrangement with that officer, nor unless the slate is passed by the Superintendent of Public Buildings for the time being; and that the certificate of that officer and as to what (if any) claims, and which claims (in case of competition) are to be recognised, shall be final; and that he will not consider any claim unless all such facilities as he may require are furnished in order that he may be able to satisfy himself as to the genuineness of the claim and that all conditions have been fulfilled.

If any roofing slates which are inferior in quality to the standard sample above mentioned are dispatched by any producer from his quarry, no bonus will be paid in respect of any part of the load of slates contained in the truck or other vehicle in which such inferior slates are dispatched. If any producer dispatches, whether at the same time or at different times, more than three loads containing inferior slates, as aforesaid, no bonus will be paid to such producer in respect of any of the slates at any time dispatched by him.

William Hague, Commissioner of Public Works.

CRUSHING AND CYANIDING PLANTS.

RETURNS FROM GOVERNMENT CRUSHING AND CYANIDING PLANTS FOR THE HALF-YEAR ENDED DECEMBER 31ST, 1920.

Name of Mine.	Locality.	Weight of Ore.	Gold Bullion Recovered.	Total Value of Gold Bullion.	Yield per Ton, in Shillings.
		Tons cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
MOUNT TORRENS BATTERY AND CYANIDE WORKS.					
Deloraine South	Kersbrook.....	5 16 0	4 19 11	18 18 8	65
Stirling Reef	Mylor	6 0 0	0 11 17	1 17 7	6
Deloraine South	Kersbrook.....	5 15 0	8 13 3	32 15 1	114
Cahill Bros.	Birdwood	5 0 0	99 5 7	383 0 10	1,532
Deloraine South	Kersbrook.....	6 4 0	7 2 2	26 16 11	86
Virtue Gold Mine ..	Willunga	7 0 0	0 [illegible] 3	1 10 5	[illegible]
Total		35 15 0	121 0 19	464 19 [illegible]	260
Grand total since starting of battery ..		11,420 17 3	6,972 9 23	26,236 17 5	46
PETERBOROUGH BATTERY AND CYANIDE WORKS.					
New Milo	Wadnaminga	4 10 0	4 12 16	15 1 9	60
Homeward Bound ..	Mannahill	7 15 0	9 14 13	35 12 11	92
" .	"	5 10 0	8 7 12	31 19 6	116
Mining Camp	Teetulpa	0 10 0	0 16 7	2 18 5	116
Total.....		18 5 0	23 11 0	85 12 7	94
Grand total since starting of battery ..		5,374 0 0	4,943 18 6	18,385 11 3	68
TARCOOLA BATTERY AND CYANIDE WORKS.					
Royal George	Tarcoola	26 5 0	5 0 23	15 14 3	12
Tarcoola Perseverance	"	39 5 0	26 12 21	96 1 4	49
Royal George	"	28 10 0	5 6 3	17 6 2	12
Wondergraph	"	6 16 0	19 8 11	55 7 6	163
"	"	7 0 0	8 0 19	25 3 9	72
Total.....		107 16 0	64 9 5	209 13 0	38
Grand total since starting of battery ..		9,124 7 3	11,547 4 21	40,641 15 4	89
GLENLOTH BATTERY AND CYANIDE WORKS.					
New Glenloth Mine..	Glenloth	18 7 0	27 17 2	80 11 7	88
Grand total since starting of battery ..		3,391 5 0	2,583 10 13	8,645 11 0	51

RETURNS FROM CRUSHING AND CYANIDING PLANTS (OTHER THAN GOVERNMENT) FOR THE HALF-YEAR ENDED DECEMBER 31ST, 1920.

Name.	Ore Treated.	Gold Bullion Recovered.	Value.	Yield per Ton, in Shillings.
	Tons cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
DELORAINE GOLD MINE.				
Deloraine	235 0 0	188 16 4	695 9 2	—
*Total	235 0 0	188 16 4	695 9 2	59½

* Also 7 cwts. 1 qr. 10 lbs copper, and silver 55 ozs. 10 dwts. 11 grs.

TOTAL BATTERY AND CYANIDE RETURNS FROM ALL PLANTS FOR SIX MONTHS ENDED DECEMBER 31ST, 1920.

Name.	Ore Treated.	Gold Bullion Recovered.	Value.	Yield per Ton, in Shillings.
	Tons. cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
Mt. Torrens	35 15 0	121 0 19	464 19 5	260
Peterborough	18 5 0	23 11 0	85 12 7	94
Tarcoola	107 16 0	64 9 5	209 13 0	38
Glenloth	18 7 0	27 17 2	80 11 7	88
Deloraine	235 0 0	188 16 4	695 9 2	59½
Total	415 3 0	475 14 6	1,536 5 10	74

SUMMARY SHOWING TOTAL ORE TREATED AT STATE BATTERIES AND CYANIDE WORKS TO DECEMBER 31ST, 1920, FROM MINES HEREUNDER.

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs.	dwts.	grs.	£	s.	d.	s.
Associated	Tarcoola	50	13	0	43	6	5	152	18	3	60
Ajax	Waukaringa	125	10	0	89	3	7	347	19	9	55
Angepena Treasure	Mount Serle	4	7	0	17	10	3	69	7	5	318
Block 245	Wadnaminga	4	16	0	9	16	10	33	18	8	141
Block 249	Wadnaminga	4	13	0	4	15	12	17	8	10	74
Bohun	Tarcoola	93	15	0	27	16	23	99	14	0	21
Barossa Cement	Barossa	98	10	0	28	9	3	114	16	6	23
Banksia	Woodside	219	17	2	180	13	7	698	11	6	63
Blumberg	Birdwood	699	12	0	600	7	22	2,257	8	4	64
Blumberg Proprietary	Birdwood	481	2	0	213	6	4	769	17	4	32
Brind	Woodside	127	16	3	44	18	4	153	0	8	23
Bird-in-Hand	Woodside	154	11	0	48	6	2	248	5	2	32
Boomerang	Outalpa	80	15	0	69	12	16	227	19	6	56
Blunsdens	Peterborough	39	19	0	3	0	19	9	14	0	4
Brilliant	Macaw Creek	9	2	0	8	15	8	29	5	10	64
Cahill Bros.	Birdwood	5	0	0	99	5	7	383	0	10	1,532
Camp	Teetulpa	0	10	0	0	16	7	2	18	5	116
Crane's Reef	Birdwood	120	12	0	41	2	10	152	7	11	25
Curdnatta	Tarcoola	777	1	0	943	3	6	3,472	4	6	89
Cobra	Birdwood	7	3	0	1	15	4	5	6	0	14
Crown	Birdwood	264	1	3	130	7	22	466	8	0	35
Copperlinka	Olary	165	3	0	111	3	0	419	3	6	50
Day Dawn	Tarcoola	983	13	0	1,546	14	19	5,172	13	7	105
Dark Hill	Near Tarcoola	25	10	0	6	3	17	20	15	9	16
Duchess Neindorf	Tweedvale	52	4	0	54	5	4	198	0	8	75
Deloraine	Kersbrook	482	12	2	569	16	23	2,116	18	8	87
Deloraine South	Kersbrook	17	15	0	20	14	6	78	10	8	88
Dart's Syndicate	Mt. Torrens	64	14	0	19	0	0	74	0	0	22
Durdan	Birdwood	217	16	2	83	16	12	316	10	4	29
Diamond Jubilee	Silverton, N.S.W.	12	6	0	4	7	7	13	5	10	21
Dustholes	*Vide* Myrtle		—			—			—		—
Emily	Williamstown	37	16	0	26	4	5	96	8	0	51
Esmonde	Wadnaminga	30	10	0	34	1	11	126	10	1	83
Eureka	Woodside	708	0	3	448	10	2	1,446	11	8	40
Evening Star	Tarcoola	11	2	2	14	5	23	42	19	0	77
Eclipse	Tarcoola	42	4	0	35	8	16	124	10	10	59
Eudunda Hope	Mannahill	32	15	0	7	18	13	30	13	4	18
Federal	Tarcoola	44	3	0	2	6	0	7	1	4	3
Federal	Woodside	41	1	0	20	16	11	81	18	6	39
Flagstaff	Birdwood	10	2	0	3	16	9	14	2	8	28
Fabian's Glenloth	Glenloth	18	10	0	18	18	13	72	17	7	78
Fabian's No. 2	Glenloth	31	13	0	14	5	4	45	12	8	28
Fabian's No. 3 (New Glenloth Gold Mining Syndicate)	Glenloth	1,019	16	0	1,269	14	3	4,259	0	11	83
Great Eastern	Wadnaminga	21	16	0	31	10	21	109	15	5	100
Gallipoli (New Chum)	Tarcoola	170	1	0	214	3	4	723	16	4	85
Government Mine	Tarcoola	445	6	0	1,024	16	22	3,386	1	1	152
Great Talunga (Black Snake)	Birdwood	369	4	3	225	7	15	834	0	1	45
Golden Gate	Angaston	159	4	0	283	9	8	1,185	15	8	149
Gowland's Reef	Mt. Torrens	101	8	3	29	11	4	106	7	3	21
Golden Thorpe	Woodside	205	17	0	86	18	10	342	4	6	33
Golden Junction	Mt. Grainger	226	15	0	151	16	8	578	18	7	51
Glen Markie	Glenloth	369	10	0	202	6	4	712	3	4	38
Great Glenloth	Glenloth	26	10	0	5	19	11	22	16	11	17
Glenloth Pioneer	Glenloth	37	19	2	29	5	9	106	18	8	56
Golden Stream	North-east	10	17	0	6	4	14	21	17	10	40
Glenloth Well	Glenloth	26	0	0	23	11	16	83	19	10	64

SUMMARY SHOWING TOTAL ORE TREATED, ETC.—*continued.*

Name of Mine.	Locality.	Weight of Ore			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs.	dwts.	grs.	£	s.	d.	s.
Golden Record	Wadnaminga	24	15	0	33	16	17	122	4	9	98
Hennig's	Parnaroo	98	12	0	22	11	10	78	0	3	15
Hall's Reef	Forest Range	50	10	0	68	10	1	247	13	11	98
Haklo	Birdwood	291	12	0	180	3	1	709	8	11	48
Homeward Bound	Mannahill	720	16	0	1,229	6	13	4,818	6	6	133
Hidden Secret	Birdwood	77	4	0	429	19	2	1,654	9	11	430
Hidden Treasure	Tarcoola	52	10	0	36	14	5	117	8	1	45
Ironclad	Mt. Grainger	12	6	0	11	18	9	44	9	5	72
Klondyke	Mannahill	43	0	0	90	12	9	352	4	7	163
Kluge	Lyndoch	6	17	0	0	12	3	2	0	0	5
Kittacoola	Palmer	14	15	0	18	17	8	69	5	11	94
Kirkeek's Treasure	Nillinghoo	485	0	0	780	11	9	2,845	15	0	117
King's Bluff	Olary	127	0	0	250	0	0	750	0	0	118
Lake Labyrinth	25 miles E. of Tarcoola	64	10	0	56	10	11	207	2	3	64
Last Resource	Tarcoola	152	15	0	108	9	20	384	1	9	50
Lease 938	Tarcoola	9	10	0	3	13	18	12	5	4	25
Lease 1022	Tarcoola	12	4	0	8	13	18	23	17	9	39
Lucky Hit	Birdwood	338	16	1	303	6	3	1,148	2	11	67
Little Crumb	Birdwood	77	11	2	136	14	7	516	5	7	133
Lux	Olary	265	8	0	156	4	21	550	17	0	41
Lady Alice	Barossa	24	1	0	49	15	22	195	13	4	162
Lady Edith	Peterborough	10	0	0	1	6	0	4	9	4	9
Lone Hand	Glenloth	446	10	0	522	5	1	1,840	11	11	82
Lake View	Glenloth	18	7	0	25	3	10	88	6	2	96
Last Chance	North-east	11	0	0	2	18	11	11	3	3	20
Morning Star	Tarcoola	307	0	0	555	15	7	1,876	4	10	122
Menzies Barossa	Barossa	23	14	0	15	1	14	52	10	0	44
Mount Torrens	Mt. Torrens	1,252	11	0	652	10	16	2,483	18	5	39
Mount Grainger	Mt. Grainger	690	3	1	725	17	14	2,872	8	6	83
Myrtle (Dustholes)	Mt. Grainger	282	7	1	109	6	23	387	14	5	27
Mount Mitchell	Glenloth	28	9	0	7	6	6	23	5	5	16
Medora	Mt. Grainger	200	0	0	182	6	23	694	9	9	69
Miners Dream	Mt. Grainger	18	13	0	9	3	18	33	11	10	35
Mount Paratoo	Paratoo	50	0	0	5	0	16	15	7	0	6
Mount Lyndhurst	Lyndhurst	1	8	0	0	7	1	1	3	11	16
Nackra	Nackra	36	18	0	7	2	21	25	5	3	13
Newbridge	Paracombe district	2	0	0	0	10	20	1	18	0	19
New Era	Woodside	794	18	0	455	6	13	1,756	6	2	44
New Eclipse or LeHunte	Woodside	189	5	0	141	13	23	529	16	9	56
New Milo	Wadnaminga	210	15	0	260	17	6	898	14	6	85
Nectar	Mannahill	18	14	0	28	10	23	109	2	2	116
Nil Desperandum	Glenloth	69	0	0	21	13	17	75	3	3	21
Outalpa	Outalpa	90	9	0	53	18	16	184	1	3	40
Perseverance (Gourlay's Claim)	Earea Dam	34	10	0	16	7	11	62	17	7	36
Proprietary	Tarcoola	6	0	0	3	8	8	10	13	6	35
Pioneer	Callington	97	2	0	31	8	20	120	16	9	24
Phoenix	Gawler	11	15	0	6	6	8	21	9	6	36
Royal Charlie	Mannahill	20	7	0	5	10	5	15	19	1	15
Royal George	3 m.W. Tarcoola	1,184	12	0	607	2	7	2,204	16	3	37
Royal Tiger	Glenloth	53	5	0	32	5	15	115	4	10	43
Ruby	Barossa	16	2	0	23	7	23	88	13	4	110
Reddaway's	Mt. Torrens	150	2	1	40	2	9	131	3	4	17
Scotchman	Teetulpa	14	17	0	9	18	20	34	4	8	46
Schuppan (Kluge)	Lyndoch	14	8	0	2	19	7	10	11	2	14
Section 121	Hd. of Talunga	3	15	0	2	2	9	7	15	6	41
Spanish American	Mannahill	21	3	2	10	12	11	39	6	3	37

SUMMARY SHOWING TOTAL ORE TREATED, ETC.—*continued.*

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs	dwts	grs.	£	*s.*	*d.*	*s.*
Shamrock	Tarcoola	48	0	0	77	13	23	303	1	9	126
Sheoak Ridge	Williamstown..	15	10	0	18	1	1	69	8	5	89
Sims Section	Mt. Torrens ...	73	18	0	13	0	0	46	11	11	12
Schubert's Reef	Mt. Torrens ...	95	18	0	54	5	2	187	15	4	39
South Knappa	Woodside	7	13	0	3	7	11	13	2	6	34
Stars and Stripes	Mt. Grainger ..	20	3	0	5	18	10	22	17	7	22
Stirling Reef	Mylor	6	0	0	0	11	17	1	17	7	6
Triumph	Wadnaminga .	17	18	0	8	11	17	32	4	3	35
Tarcoola Blocks	Tarcoola	650	3	0	950	12	8	2,917	8	9	82
Tarcoola Blocks, Enterprise Lease	Tarcoola	402	11	1	484	10	20	1,661	19	5	80
Tarcoola United	Tarcoola	56	10	0	100	0	15	331	4	3	117
The Gem	Tarcoola	42	12	0	90	6	19	277	16	11	130
Tarcoola West	Tarcoola	53	5	0	63	14	4	253	5	11	95
Tarcoola Perseverance	Tarcoola	2,202	5	3	3,488	13	21	12,975	18	4	117
Tolmer's Hill.....	Tarcoola	6	0	0	1	11	16	5	8	0	18
Union Jack	Waukaringa ..	17	2	0	2	16	13	9	18	9	11
Ulooloo	Ulooloo	28	5	0	13	5	11	52	19	0	37
Vienna (Descovitch's Reef)	Mt. Pleasant ..	29	3	0	14	0	3	47	15	7	32
Virginia	Wadnaminga .	13	1	0	18	10	14	68	6	1	104
Virtue.....	Willunga.....	7	0	0	0	9	3	1	10	5	4
Warrigal South	Tarcoola	73	12	3	107	2	12	341	1	6	92
Wondergraph	Tarcoola	49	11	0	103	0	0	342	3	0	139
Warrigal	Tarcoola	118	17	0	134	16	4	347	18	5	58
Wilgena Syndicate ..	Tarcoola	29	15	0	23	15	12	88	10	7	59
Wilgena Enterprise ..	Earea Dam....	348	8	0	323	7	22	1,279	8	2	73
Wilgena Associated ..	Tarcoola	45	0	0	98	10	10	364	3	11	161
Wheal Ellen	Strathalbyn ...	68	0	0	18	9	5	62	8	11	18
Welsh Prince.....	Wadnaminga ..	10	0	0	3	10	13	12	8	0	25

COPPER.

AVERAGE MONTHLY PRICE OF COPPER PER TON, JANUARY TO DECEMBER, 1920.

	Standard.			Best Selected.			Electrolytic.		
	£	s.	d.	£	s.	d.	£	s.	d.
January	118	4	1	123	5	7	123	18	10
February	120	6	2	126	16	3	128	10	6
March	109	11	11	118	5	7	119	14	4
April	103	2	11	111	18	11	112	15	0
May	96	18	1	109	5	0	110	7	0
June	88	0	0	102	4	5	104	11	4
July	90	5	7	105	5	7	108	17	6
August	94	1	1	106	12	3	114	0	6
September	96	13	4	106	17	6	114	13	2
October	93	10	1	102	10	0	106	7	2
November	84	18	7	93	6	8	95	10	11
December	75	16	8	84	13	4	86	13	7
Average for 1920	97	12	4½	107	11	9	110	10	0

Average of Standard Copper for the six months ended, December 31st, 1920, is £89 4s. 3d.

AVERAGE PRICE OF STANDARD COPPER FOR THE LAST TEN YEARS.

	£	s.	d.		£	s.	d.
1911	56	1	10	1916	116	1	3
1912	73	1	3	1917	125	2	4
1913	68	5	8	1918	115	11	6
1914	60	8	1†	1919	90	19	3
1915	72	12	9	1920	97	12	4½

Average for the 10 years, £87 11s. 7d.

† Quotations for nine months only.

GOVERNMENT DRILLING OPERATIONS.

REPORT BY THE SUPERVISOR OF BORING OPERATIONS.

Diamond Drilling.

During the six months ended December 31st, 1920, the No. 1 diamond-drilling plant was employed at Cunliffe and on the Yelta reserve near Moonta.

The *No. 1 bore, Cunliffe*, was continued and reached a total depth of 351ft., the bottom being red coarse-grained granite. Below 235ft. the core showed no trace of metallic minerals, the rocks overlying the granite being limestone and quartzite.

No. 2 bore, Cunliffe, inclined at 75° from the horizontal, was then started at a point 65ft., N. 36° E., from No. 1 bore, to prospect any north-easterly extension of the lode beyond the existing workings. At depths between 160ft. and 207ft. from the surface, specks of pyrite and chalcopyrite were seen in a core consisting essentially of limestone. No further trace of lode matter was seen, and the bottom of the borehole was in hard granite.

No. 3 bore, Cunliffe, situated 181ft. N. 57° 30′ E. from No. 2 bore, and inclined to the horizontal at 60°, failed to prove the presence of any metallic minerals, and bottomed in quartzite at 285ft.

No. 4 bore, Cunliffe, at a point 46ft. S.E. of No. 1 bore, was then drilled at an inclination of 60° to test the S.W. extension of the lode beyond the workings. At 170ft. from the surface traces of pyrite and chalcopyrite were seen, disseminated through limestone, and continued for a few feet. The borehole was abandoned in limestone at 205ft.

The drill was then removed to the Yelta Mine, and boring was resumed on Block No. 3 within the reservation (*vide* Mining Review, No. 28, page 10). No. 25 bore of the Yelta series was started at an angle of 60°, at a place 202ft. distant, N. 40° 30′ E., from No. 16 bore, to cut the line of the Eastern Lode. The borehole was successful, and penetrated the lode at depths between 126ft. 4in. and 128ft. 9in. from the surface. Below this point, to a depth of 135ft., specks of chalcopyrite occur in the felspar porphyry. The borehole was continued to a total depth of 181ft. The core recovered represented only a portion of the lode which proved to be friable. The sediment, consisting of drillings washed up with the return water, and the slimes deposited from this water, were separately saved and assayed, with the results shown in the following table:—

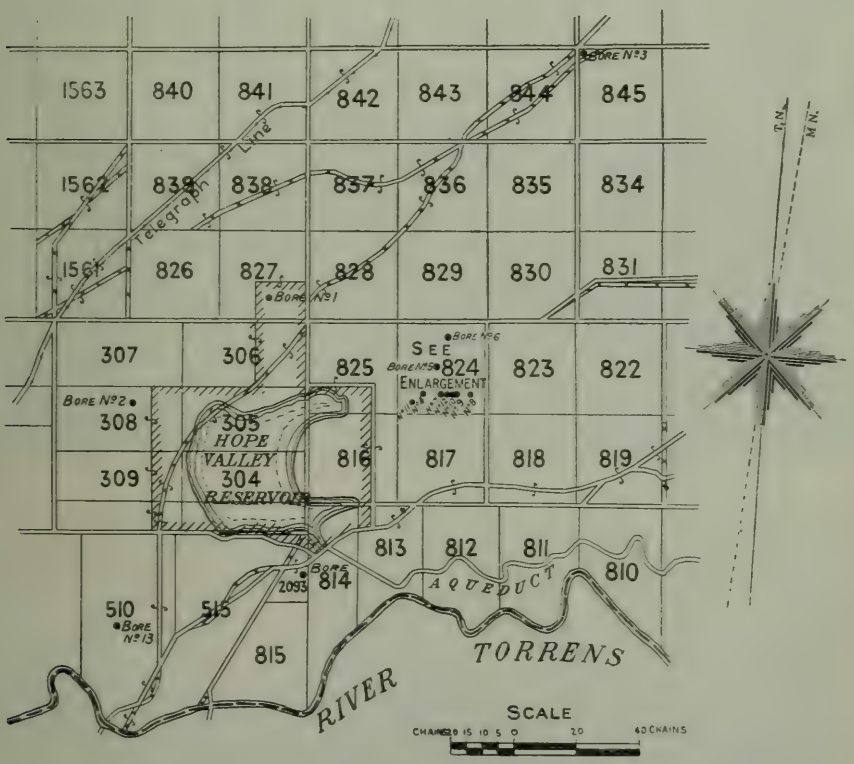
Description.	Depth, along Borehole.	Gold.	Silver.	Copper.
	Ft. In. Ft. In.	Per Ton.	Per Ton.	Per cent.
Core	127 9 — 128 9	Nil	Nil	0·2
Sediment	126 4 — 127 9	Trace	Nil	7·1
Sediment	127 9 — 128 9	Trace	Nil	7·6
Slime	126 4 — 128 9	Nil	Nil	1·9

The average value of the lode intersected, taking into consideration the values contained in all the samples of core, sediment, and slime, appears to be 3.85 per cent. copper.

No. 26 bore of the Yelta series was then started at a point 150ft. N. 40° 30′ E. from No. 25 bore, at an inclination of 60° from the horizontal, to ascertain whether the lode extends farther to the north-east.

BORING OPERATIONS FOR LIGNITE AT HOPE VALLEY.

Some years ago a borehole was drilled in section 2093, hundred of Yatala, with a calyx drill of old pattern. The results are recorded in Mining Reviews No. 14, page 10, and No. 20, pages 19 and 40-41. By reference to the lastmentioned report it will be seen that the core was not by any means complete owing to the friability of the lignite. A Victoria rotative and percussive drill, designed to recover accurate and complete samples of the materials pierced, was purchased by the Government, and a commencement was made with the work of testing the extent and quality of the lignite at Hope Valley.



PORTION OF THE HUNDRED OF

YATALA

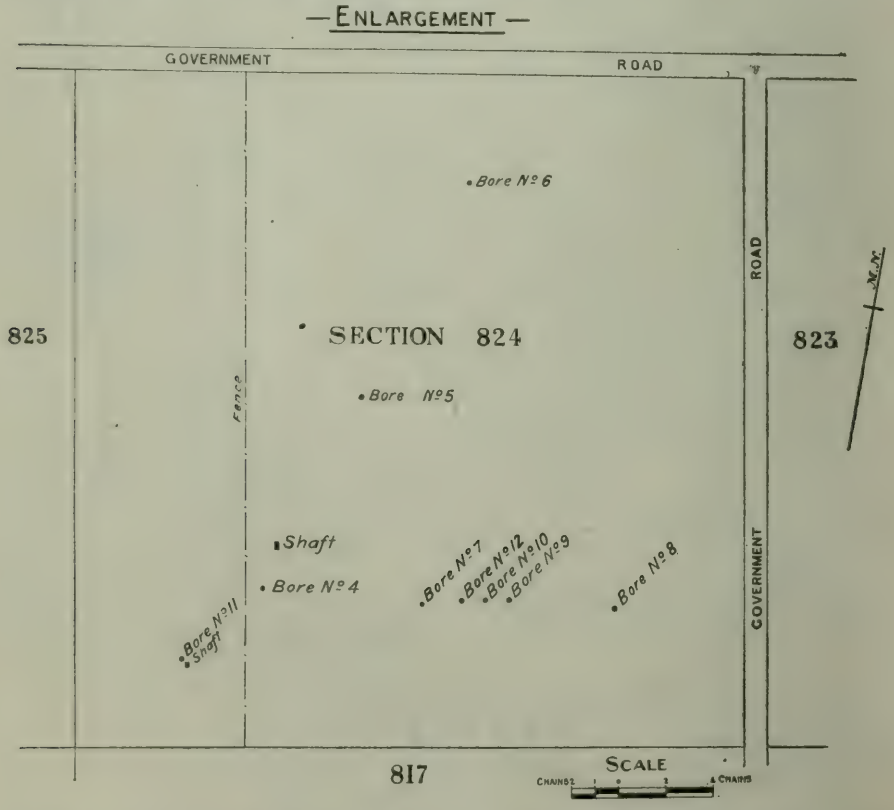
SHOWING SITES OF GOVERNMENT BORES

Three exploratory boreholes in sections 827, 308, and 845, hundred of Yatala, drilled within the holdings of a syndicate prepared to open up the lignite if the deposit proved workable, were entirely unsuccessful.

The first of these, within section 827, reached bedrock at a depth of only 17ft. beneath the surface; the second, within section 308, reached bedrock at 145ft. from the surface—approximately the depth at which lignite occurs to the eastward; and the third, in the north-western corner of section 845, reached bedrock at 60ft., without having shown any lignite, and after passing through sand, gravel, and clay.

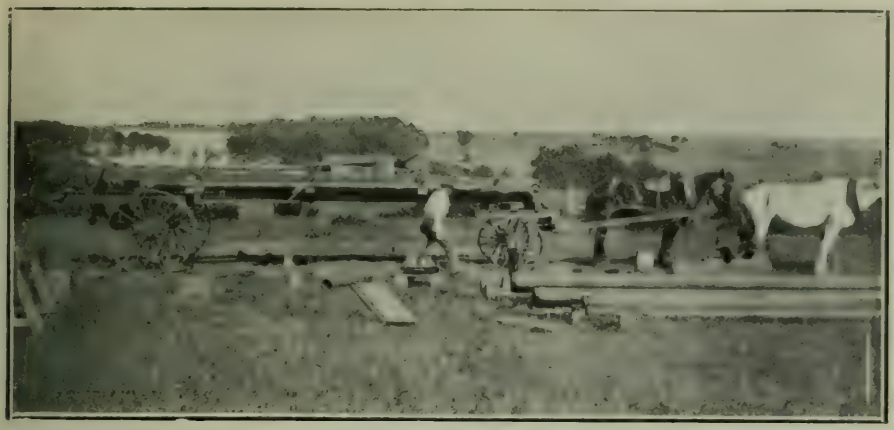
The drill was then transferred to the holdings of the S.A. Brown Coal Mining and Briquette Manufacturing Company, No-liability, and work was started in section 824, hundred of Yatala. By reference to the plan showing the position of the bores within this section, it will be seen that boring was started near a shaft which was sunk successfully to water level a few months ago, but which was subsequently abandoned owing to the difficulties encountered in the attempt to penetrate a considerable thickness of running drift sand.

Bores Nos. 4, 5, and 6 were drilled, with the results set out in the accompanying sections, and the samples of lignite and lignitic clays recovered were separately assayed, with the results shown below. On the completion of No. 6 borehole, another line of holes was started to test the extent of the lignite beds in an easterly direction. No. 7 borehole cut the lignite, but No. 8 borehole passed through clay and entered slate bedrock without having shown any trace of lignite.

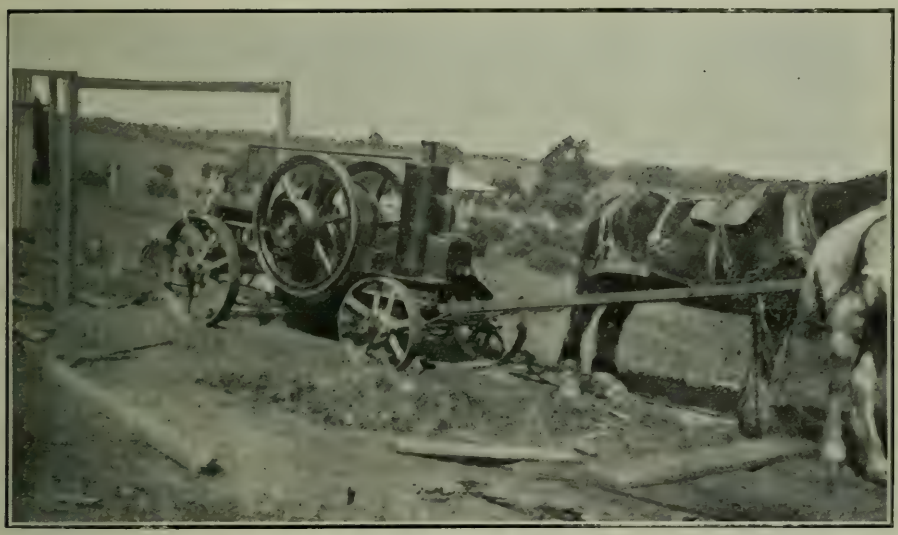


Subsequent boring operations indicate that the lignite does not extend to the eastward much beyond No. 7 borehole, as it is not present in Nos. 9, 10, and 12, the sites of which are shown on the plan.

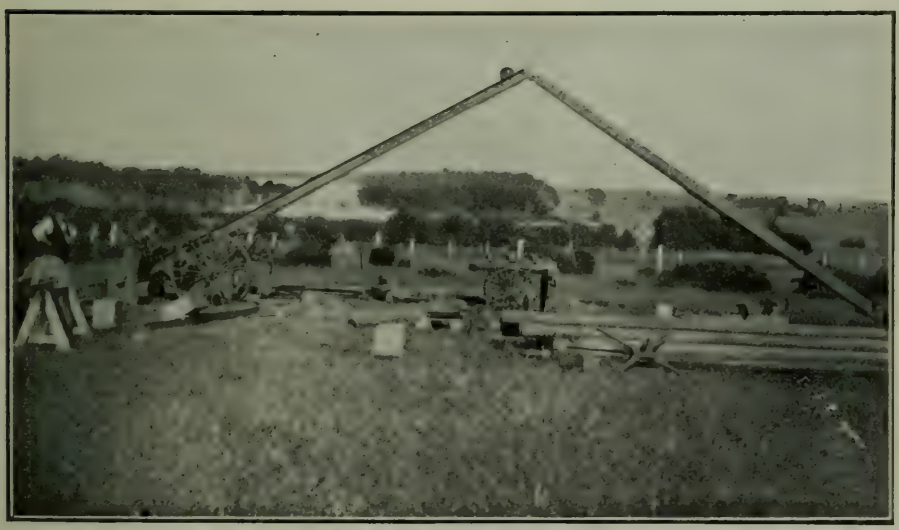
Victoria Rotative and Percussive Drill used in Exploring Lignite Deposits.



Transporting the Derrick.



Oil Engine of Drill.



Lowering the Derrick.

To face p. 26.]

This work, though negative as far as concerns the proving of lignite, is valuable in that it has indicated a site for a shaft in country beyond the troublesome quicksand, but still quite close to the lignite.

The general results obtained during these boring operations point to the necessity for carefully testing the extent of lignite beds such as occur at Hope Valley by means of a plant capable of giving detailed information. The ordinary percussion drill is apt to give very misleading information, and the sludge recovered has little value as a sample of the beds traversed. By reference to the sections printed herewith and the tabulated results of the assay of the samples of lignite, it will be seen that there is a very marked variability of composition in the beds of lignite and lignite-bearing clay that were regarded as portions of a practically homogeneous bed, when the only samples available for examination were sludge samples recovered with the aid of a plant designed for water-boring.

The general character of the lignite at Hope Valley is comparable with that occurring at Noarlunga, Moorlands, and Bower, as far as appearance and general chemical composition are concerned. The age of the lignite-bearing beds has not yet been determined. Some leaf-fragments were obtained in the clay between the lignite beds at a depth of between 160ft. and 170ft. in No. 5 borehole. These were submitted to the National Museum in Melbourne, but were not sufficiently well-preserved for the age of the beds to be deduced. One leaf appeared to have been derived from a eucalypt.

In the following tables, showing the composition of the lignite at the sites of Nos. 4, 5, 6, 7, and 11 boreholes, it will be seen that a content of 24 per cent. of ash in the analyses of the samples as raised (equivalent to about 40 per cent. of ash in the air-dried samples) was taken as the limiting figure distinguishing "lignite" from "lignitic clay." The determination of sulphur has been made in the case of the "lignite" samples only.

The arithmetic mean of lignite analyses, numbered 22 to 34 inclusive, from the lower bed cut in No. 4 bore, was found to be, on air-dried samples—

Moisture at 105° C.	10.19	per cent.
Volatile matter	37.72	"
Fixed carbon	25.07	"
Ash	27.02	"
Sulphur	2.84	"

The califoric value of such fuel is between 6,700 and 7,000 British thermal units per pound.

No. 4 BORE, HOPE VALLEY.

Number of Sample.	Description.	Depth from Surface.	Analysis as Raised.			
			Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.
		Ft. In. Ft. In.	%	%	%	%
1	Lignitic clay.....	150 0—152 8	26·16	25·77	11·62	36·45
2	Lignite	152 8—154 2	46·84	28·08	15·06	10·02
3	Lignite	154 2—159 6	56·57	15·51	10·81	17·11
4	Lignite	159 6—160 4	51·39	25·12	15·34	8·15
5	Lignite	160 4—161 4	51·38	25·15	16·48	6·99
6	Lignite	161 4—162 2	49·59	26·01	15·78	8·62
7	Lignite	162 2—164 2	44·40	23·57	15·33	16·70
8	Lignitic clay.....	164 2—165 2	29·26	11·59	4·93	54·22
9	Lignitic clay.....	165 2—166 2	23·40	10·35	2·81	63·44
10	Lignitic clay.....	166 2—167 5	25·85	10·70	4·15	59·30
11	Lignitic clay.....	167 5—168 6	21·17	10·05	2·87	65·91
12	Lignitic clay.....	168 6—169 7	22·06	12·22	3·28	62·44
13	Lignitic clay.....	169 7—170 8	21·40	12·50	2·63	63·47
14	Lignitic clay.....	170 8—171 5	29·53	14·50	5·15	50·82
15	Lignitic clay.....	171 5—172 3	35·08	16·78	6·42	41·72
16	Lignitic clay.....	172 3—173 3	47·12	17·77	10·80	24·31
17	Lignitic clay.....	173 3—174 3	42·32	17·48	9·28	30·92
18	Lignitic clay.....	174 3—175 0	40·00	16·77	6·79	36·44
19	Lignite	175 0—175 11	53·68	21·85	13·73	10·74
20	Lignite	175 11—176 11	39·67	24·95	13·91	21·47
21	Lignitic clay.....	176 11—177 10	20·59	8·39	1·75	69·27
22	Lignite	177 10—179 2	48·88	23·24	11·82	16·06
23	Lignite	179 2—180 3	52·25	20·01	13·01	14·73
24	Lignite	180 3—181 3	53·26	23·47	12·48	10·79
25	Lignite	181 3—181 11	48·33	23·10	11·16	17·41
26	Lignite	181 11—183 11	53·38	24·16	12·05	10·41
27	Lignite	183 11—184 10	49·07	26·65	8·92	15·36
28	Lignite	184 10—186 10	53·24	23·83	11·78	11·15
29	Lignite	186 10—188 2	49·91	22·17	11·34	16·58
30	Lignite	188 2—190 2	43·99	20·15	13·39	22·47
31	Lignite	190 2—191 4	49·04	19·70	12·39	18·87
32	Lignite	191 4—193 4	55·52	18·80	14·90	10·78
33	Lignite	193 4—194 4	51·53	19·68	14·22	14·57
34	Lignite	194 4—196 0	46·17	24·27	8·40	21·16
35	Lignitic clay.....	196 0—197 9	53·66	14·57	5·65	26·12
36	Lignitic clay.....	197 9—199 1	22·23	11·76	5·56	60·45
37	Lignitic clay.....	199 1—200 5	37·60	15·22	9·38	37·80
38	Lignitic clay.....	200 5—201 2	45·46	11·22	5·44	37·88
39	Lignitic clay.....	201 2—201 9	21·42	9·24	2·97	66·37
40	Lignitic clay.....	201 9—202 9	43·97	21·56	7·74	26·73

No. 4 BORE, HOPE VALLEY.

Number of Sample.	Description.	Depth from Surface.				Analysis when Air-dried.				
						Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
		Ft.	In.	Ft.	In.	%	%	%	%	%
1	Lignitic clay.....	150	0	152	8	9·98	30·54	15·13	44·35	2·46
2	Lignite	152	8	154	2	15·80	41·74	26·48	15·98	4·65
3	Lignite	154	2	159	6	13·06	27·55	25·43	33·96	3·68
4	Lignite	159	6	160	4	17·08	46·84	25·22	10·86	4·59
5	Lignite	160	4	161	4	16·09	45·92	25·70	12·29	4·77
6	Lignite	161	4	162	2	15·61	44·04	25·74	14·61	4·31
7	Lignite	162	2	164	2	13·31	42·70	17·12	26·87	3·49
8	Lignitic clay.....	164	2	165	2	4·32	16·39	6·12	73·17	—
9	Lignitic clay.....	165	2	166	2	3·15	13·25	3·87	79·73	—
10	Lignitic clay.....	166	2	167	5	3·59	15·36	3·41	77·64	—
11	Lignitic clay.....	167	5	168	6	2·53	12·21	3·31	81·95	—
12	Lignitic clay.....	168	6	169	7	2·88	16·44	2·56	78·12	—
13	Lignitic clay.....	169	7	170	8	2·86	16·16	2·48	78·50	—
14	Lignitic clay.....	170	8	171	5	4·82	21·83	3·71	69·64	—
15	Lignitic clay.....	171	5	172	3	6·13	25·01	7·99	60·87	—
16	Lignitic clay.....	172	3	173	3	9·80	28·53	19·48	42·19	—
17	Lignitic clay.....	173	3	174	3	8·13	28·53	13·22	50·12	—
18	Lignitic clay.....	174	3	175	0	7·45	22·83	12·97	56·75	—
19	Lignite	175	0	175	11	12·18	39·29	28·06	20·47	3·06
20	Lignite	175	11	176	11	10·23	35·55	21·64	32·58	2·95
21	Lignitic clay.....	176	11	177	10	1·40	11·56	1·27	85·77	—
22	Lignite	177	10	179	2	12·80	43·73	15·95	27·52	2·94
23	Lignite	179	2	180	3	12·13	35·39	24·63	27·85	3·13
24	Lignite	180	3	181	3	11·81	42·09	25·84	20·26	3·13
25	Lignite	181	3	181	11	10·29	38·84	30·24	20·63	2·90
26	Lignite	181	11	183	11	11·84	38·14	30·90	19·12	3·14
27	Lignite	183	11	184	10	11·33	38·59	22·99	27·09	2·89
28	Lignite	184	10	186	10	12·49	37·65	28·69	21·17	3·09
29	Lignite	186	10	188	2	11·20	37·66	23·00	28·14	3·17
30	Lignite	188	2	190	2	6·48	31·57	24·22	37·73	2·49
31	Lignite	190	2	191	4	7·20	32·58	25·43	34·79	2·51
32	Lignite	191	4	193	4	10·53	37·62	30·34	21·51	2·91
33	Lignite	193	4	194	4	7·12	36·78	27·66	28·44	2·54
34	Lignite	194	4	196	0	7·26	39·77	16·03	36·94	2·14
35	Lignitic clay.....	196	0	197	9	10·10	28·29	12·20	49 41	—
36	Lignitic clay.....	197	9	199	1	5·25	13·99	7·09	73·67	—
37	Lignitic clay.....	199	1	200	5	11·35	21·50	13·47	53·68	—
38	Lignitic clay.....	200	5	201	2	7·74	19·28	9·40	63 58	—
39	Lignitic clay.....	201	2	201	9	3 93	11·13	4·02	80·92	—
40	Lignitic clay.....	201	9	202	9	13·23	29·84	16·29	40·64	—

No. 5 BORE, HOPE VALLEY.

Number of Sample.	Description.	Depth from Surface.	Analysis as Raised.			
			Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.
		Ft. In. Ft. In.	%	%	%	%
B1	Lignite	144 0—147 8	55·37	23·24	16·63	4·76
B2	Lignite	147 8—151 4	54·90	23·02	17·05	5·03
B3	Lignite	151 4—155 0	50·50	23·89	17·08	8·53
B4	Lignitic clay.....	155 0—156 9	44·19	18·93	11·05	25·83
B7	Lignite	176 3—176 6	47·45	16·46	12·61	23·48
B9	Lignitic clay.....	178 0—184 3	44·13	19·48	10·68	25·71
B10 ...	Lignite	184 3—191 9	47·49	20·95	11·36	20·20
B11 ...	Lignitic clay.....	191 11—195 1	40·30	17·62	10·39	31·69

Number of Sample.	Description.	Depth from Surface.	Analysis when Air-dried.				
			Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
		Ft. In. Ft. In.	%	%	%	%	%
B1	Lignite	144 0—147 8	25·30	36·61	30·19	7·90	3·36
B2	Lignite	147 8—151 4	23·98	38·75	28·94	8·33	3·32
B3	Lignite	151 4—155 0	22·91	36·03	28·08	12·98	3·51
B4	Lignitic clay.....	155 0—156 9	10·87	28·86	18·67	41·60	—
B7	Lignite	176 3—176 6	10·90	27·86	21·41	39·83	—
B9	Lignitic clay.....	178 0—184 3	9·65	29·84	18·19	42·32	—
B10 ...	Lignite	184 3—191 9	11·74	30·70	22·85	34·71	—
B11....	Lignitic clay.....	191 11—195 1	7·94	25·67	16·41	49·98	—

No. 6 BORE, HOPE VALLEY.

Number of Sample.	Description.	Depth from Surface.	Analysis as Raised.			
			Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.
		Ft. In. Ft. In.	%	%	%	%
1C	Lignitic clay.....	153 6—156 10	38·88	18·26	8·62	34·24
2C	Lignite	156 10—160 2	42·86	19·36	14·73	23·05
3C	Lignitic clay.....	160 2—163 8	41·80	17·88	11·67	28·65
4C	Lignitic clay.....	163 8—165 8	30·75	13·41	7·95	47·89
5C	Lignitic clay.....	165 8—167 8	30·86	12·75	6·03	50·36
6C	Lignitic clay.....	167 8—169 8	30·12	10·76	6·15	52·97
7C	Lignitic clay.....	169 8—172 0	34·80	12·77	8·33	44·10

No. 6 BORE, HOPE VALLEY—*continued.*

Number of Sample.	Description.	Depth from Surface.	Analysis when Air-dried.				
			Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
		Ft. In. Ft. In.	%	%	%	%	%
1C	Lignitic clay.....	153 6—156 10	6·90	25·04	16·09	51·97	—
2C	Lignite	156 10—160 2	9·14	30·15	24·11	36·60	2·83
3C	Lignitic clay.....	160 2—163 8	7·96	27·13	20·03	44·88	—
4C	Lignitic clay.....	163 8—165 8	4·41	17·28	11·53	66·78	—
5C	Lignitic clay.....	165 8—167 8	3·74	16·44	10·09	69·73	—
6C	Lignitic clay.....	167 8—169 8	3·32	13·76	9·28	73·64	—
7C	Lignitic clay.....	169 8—172 0	4·52	19·33	11·16	64·99	—

No. 7 BORE, HOPE VALLEY.

Number of Sample.	Description.	Depth from Surface.	Analysis as Raised.			
			Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.
		Ft. In. Ft. In.	%	%	%	%
1D ..	Lignite	167 6—171 6	59·02	19·59	12·64	8·75
2D ..	Lignite	171 6—175 0	52·10	24·58	17·46	5·86
3D ..	Lignite	175 0—178 0	54·95	23·40	16·90	4·75
4D ..	Lignite	178 0—179 10	58·04	21·10	15·96	4·90
5D ..	Lignitic clay.....	179 10—184 0	38·58	17·09	9·30	35·03
6D ..	Lignitic clay.....	184 0—189 0	40·31	15·21	8·20	36·28
7D ..	Lignitic clay.....	189 0—193 6	41·14	15·41	8·66	34·79
9D ..	Lignite	199 6—204 0	46·20	25·00	13·30	15·50
10D ..	Lignite	204 0—208 0	52·97	19·20	15·53	12·30
11D ..	Lignite	208 0—212 6	46·22	21·35	14·29	18·14

Number of Sample.	Description.	Depth from Surface.	Analysis when Air-dried.				
			Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
		Ft. In. Ft. In.	%	%	%	%	%
1D ...	Lignite	167 6—171 6	12·10	39·28	29·63	18·99	3·69
2D ...	Lignite	171 6—175 0	16·38	38·69	34·22	10·71	4·12
3D ...	Lignite	175 0—178 0	17·09	38·84	35·25	8·82	3·87
4D ...	Lignite	178 0—179 10	15·48	39·28	35·57	9·67	4·18
5D ...	Lignitic clay.....	179 10—184 0	7·54	23·61	15·96	52·89	—
6D ...	Lignitic clay.....	184 0—189 0	6·57	21·18	15·63	56·62	—
7D ...	Lignitic clay.....	189 0—193 6	6·18	23·18	15·50	55·14	—
9D ...	Lignite	199 6—204 0	11·42	35·42	27·53	25·63	3·10
10D ..	Lignite	204 0—208 0	11·20	35·14	30·94	22·72	3·13
11D ..	Lignite	208 0—212 6	10·08	33·83	24·46	31·63	2·63

No. 11 BORE, HOPE VALLEY.

Number of Sample.	Description.	Depth from Surface.				Analysis as Raised.			
						Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.
		Ft.	In.	Ft.	In.	%	%	%	%
1P ...	Lignite	142	6	144	6	49·56	26·62	16·76	7·06
2P ...	Lignite	144	6	146	5	53·31	23·58	17·85	5·26
3P ...	Lignite	146	5	148	7	55·04	24·06	15·67	5·23
4P ...	Lignite	148	7	151	1	53·89	25·61	17·09	3·41
5P ...	Lignite	151	1	154	4	55·45	21·29	15·44	7·82
6P ...	Lignite	154	4	157	0	52·59	21·31	15·00	11·10
7P ...	Lignite	157	0	158	7	53·41	26·31	13·74	6·54
8P ...	Clay with lignite	158	7	161	10	32·36	16·39	4·72	46·53
9P ...	Clay with lignite	161	10	163	6	26·59	15·36	3·94	54·11
10P ...	Clay with lignite	163	6	165	0	27·37	16·02	3·54	53·07
11P ...	Lignite with clay.....	165	0	167	6	45·03	19·11	11·70	24·16
12P ...	Lignite with clay.....	167	6	169	7	41·28	16·36	9·51	32·85
13P ...	Lignite	169	7	172	4	57·83	13·71	16·09	12·37
14P ...	Lignite	172	4	177	4	49·59	21·64	13·45	15·32
15P ...	Lignite	177	4	181	4	51·40	22·85	12·62	13·13
16P ...	Lignite with clay.....	181	4	189	10	45·21	19·74	10·03	25·02
17P ...	Clay with lignite	189	10	193	1	29·56	14·20	5·24	51·00
18P ...	Clay with lignite	193	1	197	4	37·06	18·48	8·16	36·30

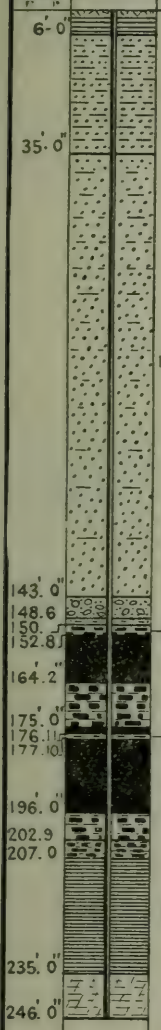
Number of Sample.	Description.	Depth from Surface.				Analysis when Air-dried.				
						Moisture at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
		Ft.	In.	Ft.	In.	%	%	%	%	%
1P ...	Lignite	142	6	144	6	10·62	46·48	30·90	12·00	5·30
2P ...	Lignite	144	6	146	5	11·66	44·09	35·20	9·05	5·45
3P ...	Lignite	146	5	148	7	11·31	44·67	33·62	10·40	4·81
4P ...	Lignite	148	7	151	1	10·91	48·29	32·85	7·95	4·54
5P ...	Lignite	151	1	154	4	11·72	40·43	32·96	14·89	4·15
6P ...	Lignite	154	4	157	0	11·21	36·14	33·62	19·03	4·23
7P ...	Lignite	157	0	158	7	11·50	44·78	31·39	12·33	3·98
8P ...	Clay with lignite .	158	7	161	10	3·94	22·95	6·64	66·47	—
9P ...	Clay with lignite.	161	10	163	6	3·26	20·22	5·31	71·21	—
10P ...	Clay with lignite .	163	6	165	0	2·95	20·02	6·04	70·99	—
11P ...	Lignite with clay.	165	0	167	6	7·93	30·95	20·56	40·56	—
12P ...	Lignite with clay.	167	6	169	7	6·56	25·02	16·31	52·11	—
13P ...	Lignite	169	7	172	4	9·89	36·40	27·37	26·34	3·16
14P ...	Lignite	172	4	177	4	9·42	37·95	25·09	27·54	3·10
15P ...	Lignite	177	4	181	4	9·56	41·02	26·58	22·84	3·30
16P ...	Lignite with clay.	181	4	189	10	6·65	31·67	19·63	42·05	—
17P ...	Clay with lignite .	189	10	193	1	3·13	17·46	9·52	69·89	—
18P ...	Clay with lignite .	193	1	197	4	5·53	23·66	16·30	54·51	—

SOUTH AUSTRALIA

DEPARTMENT OF MINES

No 4 BORE HOPE VALLEY

Angle of Bore Vertical — Hundred of YATALA — Section No 824 — Location See Locality Plan



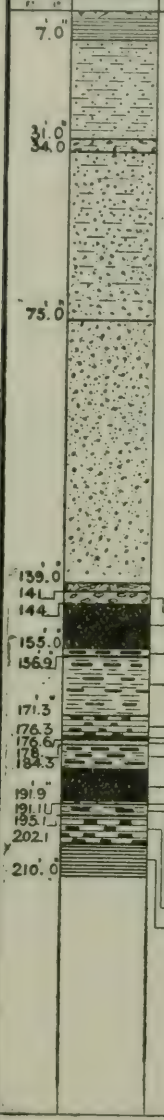
DEPTH FROM SURFACE	THICKNESS	DESCRIPTION OF ROCK	REMARKS
6'-0"	6'. 0"	Soil & clay	
	29'. 0"	Red & White Sandstone	
35'. 0"			Consolidated above water level
			Water level
	108'. 0"	Friable Argillaceous Sandstone	
			Drift sand with some clay
143'. 0"			
148.6	5.6"	Pebbles	
150.	1.6	Argillaceous Sandstone	
152.8	2.8	Lignitic clay	
164'. 2"	11.6	Lignite	
	10'. 10"	Lignitic clay	
175'. 0"	1.11	Lignite	
176.11	0.11	Lignitic clay	
177.10	18'. 2"	Lignite	
196'. 0"			
202.9	6'. 9"	Lignitic clay	
207. 0	4.3	Grey Lignitic Clay containing scattered pieces of lignite	
	28'. 0"	Clay	
235'. 0"			
246'. 0"	11'. 0"	Soft grey slate	

C. F. Duffield
Foreman.

L. Keith Ward.
Supervisor of Boring Operations.

SOUTH AUSTRALIA
DEPARTMENT OF MINES
No 5 BORE HOPE VALLEY.

Angle of Bore Vertical — Hundred of YATALA, Section No 824 — Location: See Locality Plan



DEPTH FROM SURFACE	THICKNESS	DESCRIPTION of ROCK	REMARKS
7.0"		Soil & clay	
	24.0"	Red & white sandstone	
31.0"			
34.0	3.0"	Sandstone containing smal quartz pebbles.	
	41.0"	Friable argillaceous sandstone.	
75.0"			Water level.
	64.0"	Drift sand.	
139.0"			
141	2.0"	Sand & small boulders.	
144	3.0	Argillaceous sandstone with quartz pebbles.	
155.0"			
156.9	1.1	Lignite.	
	1.9	Lignite with clay	
171.3"	14.6	Lignitic clay.	
176.3	5.0	Pale grey clay with some lignitic matter.	
176.6			
178	.3"	Lignite	
184.3	1.6	Clay with small nodules of pyrite & traces of lignite	
191.9"			
191.1	.8"		
195.1	6.3	Lignite with clay	
202.1	7.6	Lignite	
	0.2	Grey clay	
210.0"	3.2	Lignite with clay	
	7.0	Clay with lignite	
	7.11	Pale grey clay.	

C.F. Duffield. Foreman.

L. Keith Ward. Supervisor of Boring Operations.

SOUTH AUSTRALIA

DEPARTMENT OF MINES

No 6 BORE HOPE VALLEY

Angle of Bore Vertical Hundred of YATALA Section No 824 Location See Locality Plan

DEPTH FROM SURFACE Ft In	SECTION	THICKNESS Ft In	DESCRIPTION of ROCK	REMARKS
15 - 0		15 - 0	Soil, Clay & Sandstone.	
28 - 0		13 - 0	Sandstone containing small boulders & quartz pebbles.	
65 - 0		37 - 0	Friable argillaceous Sandstone.	Water Level
105 - 0		40 - 0	Drift Sand.	
117 - 0		12 - 0	Lignitic Clay.	
145 - 0		28 - 0	Coarse white Sand.	
156 - 10		11 - 10	Lignitic Clay.	
160 - 2		3 - 4	Lignite.	
172 - 0		11 - 10	Lignitic Clay.	
180 - 0		8 - 0	Argillaceous Sandstone with Lignitic matter.	
182 - 6		2 - 6	Highly plastic green Clay.	
197 - 0		14 - 6	Pale grey Clay.	

C. F. Duffield
Foreman.

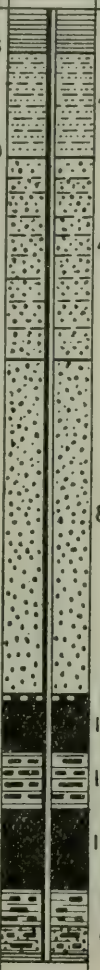
L. Keith Ward.
Supervisor of Boring Operations.

SOUTH AUSTRALIA

DEPARTMENT OF MINES

No 7 BORE HOPE VALLEY

Angle of Bore Vertical — Hundred of YATALA — Section No. 824 — Location: See Locality Plan

DEPTH FROM SURFACE Ft. In.	SECTION	THICKNESS Ft. In.	DESCRIPTION of ROCK	REMARKS
10 - 6		10 - 6	Soil & Clay	
36 - 0		25 - 6	Sandstone, yellow & red	
85 - 0		49 - 0	Argillaceous Sandstone	
166 - 0		81 - 0	Drift Sand	
167 - 6		1 - 6	Lignitic Clay	
179 - 10		12 - 4	Lignite	
193 - 6		13 - 8	Lignitic Clay	
212 - 6		19 - 0	Lignite	
221 - 6		9 - 0	Light Brown Clay, with scattered fragments of Lignite.	
228 - 0		6 - 6	Argillaceous Sandstone containing Lignitic matter.	
230 - 0		2 - 0	White Clay.	

C. F. Duffield
Foreman.

L. Keith Ward.
Supervisor of Boring Operations.

SOUTH AUSTRALIA

DEPARTMENT OF MINES

No 11 BORE HOPE VALLEY

Angle of Bore Vertical — Hundred of YATALA — Section No. 824 — Location See Locality Plan

DEPTH FROM SURFACE	SECTION	THICKNESS	DESCRIPTION OF ROCK	REMARKS
ft in		ft in		
4 - 0		4 - 0	Soil & Clay.	
		26 - 0	Sandstone, red & white.	
30 - 0				
		33 - 10	Friable argillaceous Sandstone.	
63 - 10				
64 - 9		0 - 11	Bar of Ironstone.	
		77 - 3	Drift Sand.	
142 - 0				
142 - 6		0 - 6	Lignitic Clay.	
		16 - 1	Lignite.	
158 - 7				
		11 - 0	Lignitic Clay.	
169 - 7				
		11 - 9	Lignite.	
181 - 4				
		16 - 0	Lignitic Clay.	
197 - 4				
		16 - 8	White Clay.	
214 - 0				

C. F. Duffield
Foreman.

L. Keith Ward.
Supervisor of Boring Operations.

SUBSIDIES.

The Legislature provided in the Mining Act, 1893, and in previous measures for the encouragement of mining.

The following schedule shows what subsidies have been paid from the inception of the system to December 31st, 1920. and the sums repaid. In the ordinary way these repayments are made from profits—50 per cent. of such profits being devoted to repayments. In two instances only have the profits won enabled full repayments to be accomplished—the Crystal Mine, at Echunga, which repaid £76 7s.6d. from that source, and the once-famous New Alma and Victoria Mine, Waukaringa, which repaid in full the first subsidy, £3,000. The repayment of £2,100 by the Hamley Company was made on the sale of the property to the Wallaroo and Moonta Co. The remainder of the recoveries was derived from sales of mining plant held as security. The total of the subsidies advanced is £65,108 16s. 1d., of which £11,264 15s. 4d. have been recovered, and £2,250 written off, leaving a debit balance of £51,594 0s. 9d. Portion of this outstanding debt is represented by machinery that has fallen into the hands of the Government; add to this the value of the metals won, and the State in general will probably have benefited beyond the money value of the debit balance.

STATEMENT OF SUBSIDIES PAID FROM COMMENCEMENT TO DECEMBER 31ST, 1920.

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.			Amount Repaid.		
		£	s.	d.	£	s.	d.
Adelaide Crushing, Grinding, and Amalgamating Mill Co.	—	100	0	0	—		
Algebuckina Gold Mining Syndicate	Algebuckina	52	10	11	52	10	11
Alma Extended Gold Mining Co.	Waukaringa	3,000	0	0	276	16	0
Backhouse, T. S.	Worturpa	100	0	0	—		
Barossa Enterprise Gold Mining Coy.	Barossa, Hundred of	232	2	6	—		
Belalie Copper Mining Syndicate	Bundaleer	392	12	3	5	0	0
Beltana Rapid Ore Treatment Syndicate	Near Beltana	596	8	4	—		
Bevilaqua & Angel	Palmer (near)	57	18	0	—		
Bird-in-Hand Gold Mining Co.. Ltd.	Woodside	3,000	0	0	—		
Blackfellow's Creek Gold Mining Co., Ltd.	Kuitpo, Hundred of	660	6	7	35	0	0
Callington Copper Mining Co.	Callington	148	8	7	17	10	0
Cockburn Copper Mining Co., N.L.	Mutooroo	273	18	5	173	13	8
Commonwealth Silver-lead Co., Ltd. (Wheal Ellen Mine)	Strathalbyn, Hund. of	750	0	0	440	3	3
Copper Hill Mining Co., N.L.	Kadina	391	15	0	115	0	0
Cornwall Copper Mining Syndicate, N.L.	Kadina, Hundred of	500	0	0	—		
Countess of Jersey Gold Mining Co., N.L.	Wadnaminga	321	0	0	—		
Cowell Consolidated Silver and Copper Mines	Hds. Miltalie & Hawker	406	9	8	25	0	0
Currency Creek Copper Mining Co.	Currency Creek	28	6	5	20	0	3
Crystal Gold Mining Co.	Echunga	563	17	6	176	7	6
Davis, A. (Dorris Fabian Mine)	Leigh's Creek, Near	357	0	0	—		
Ding Dong Copper Mining Syndicate	Kanmantoo, Hund. of	124	0	4	—		
Duke of Cornwall Gold Mining Syndicate	Mount Pleasant	458	17	4	43	10	0
Eagle Silver Mining Co., Ltd.	Glen Osmond	500	0	0	—		
Ediacara Consols Silver Mining Co., N.L.	Ediacara	651	12	1	465	17	0
Enterprise Copper Mining Co., N.L.	Barossa, Hundred of	150	0	0	9	16	0
Enterprise Excelsior (Barossa Amalgamated)	"	2,000	0	0	—		
Eureka Gold Mining Co., Ltd.	Woodside	1,500	0	0	—		
Eureka Gold Mining Syndicate	"	340	17	11	6	10	0
Fels, J. A. R. (Nichol's Nob Mine)	Leigh's Creek, Near	150	0	0	—		
Fifth Creek Central Silver and Copper Mining Co., N.L.	Fifth Creek	253	2	4	—		
Fortress Hill Mining Syndicate	Fortress Hill	60	0	0	—		
Foster, A. E. J. (David Copperfield Mine)	Hundred Onkaparinga.	19	5	0	—		
Glenloth Mining, Battery, & Options Co., N.L.	Glenloth	515	4	7	515	4	7
Glenloth Wells Pioneer Blocks Co., Ltd.	"	100	0	0	22	18	5
Great Eastern Gold Syndicate, N.L.	Wadnaminga	300	0	0	300	0	0

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.			Amount Repaid.		
		£	s.	d.	£	s.	d.
Gumeracha Gold Mining Syndicate	Gumeracha	75	0	0	—		
Golden Junction Gold Mining Co, N.L.	Hundred of Coglin	231	10	0	—		
Golden Point Claims	Wonna	50	0	0	—		
Great Ironclad Gold Mining Co.	Teetulpa	218	6	9	—		
Hakendorf, C. H., and Williams, J. (Glenmarkie Mine)	Glenloth	221	17	6	12	0	0
Hamley Copper Mining Co.	Wallaroo	2,100	0	0	2,100	0	0
Homeward Bound and Klondyke Gold Mines, N.L.	Mannahill	192	17	1	83	18	6
Heithersay, J. (Kirkeeks Treasure Mine)	Waukaringa	819	8	0	3	19	9
Hunter Bros. (Lady Millicent and Nuccaleena Mines)	Mochatoona	699	19	10	12	0	0
Ireby Gold Mining Syndicate	Mount Grainger	35	4	3	—		
Kanappa Copper Mining Co.	Hundred Angas	146	19	11	1	5	0
Kanmantoo Copper Mines Syndicate, N.L.	Kanmantoo	150	2	1	—		
Kingsborough, W. A. (Benowrie Mine)	Near Cutana	31	18	6	—		
Kirkeek's Treasure Gold Mining Co.	Waukaringa	691	8	1	—		
King's Bluff G.M. Co., N.L.	Olary	622	0	8	—		
Kohinoor Gold Mining Co., N.L.	Kangaroo Island	100	0	0	—		
	"	200	0	0	—		
Kohinoor Mine (H. G. Taylor)							
Lady Alice Gold Mining Co.	Barossa, Hundred of	1,797	2	3	—		
Lady Franklin Syndicate	Port Lincoln	200	0	0	40	0	0
Leigh's Creek South Coal Mining Co., N.L.	Leigh's Creek	95	16	4	95	16	4
McMurtie's Claims	Kuitpo, Hundred of	199	19	11	—		
Mingary Gold Mining Co.	New Luxemburg	400	0	0	—		
Montacute Gold and Copper Mining Co., N.L.	Sixth Creek	400	0	0	—		
Mount Victoria Mine	Bimbowrie	50	0	0	—		
Mount Malvern Silver Mining Co.	Blackwood	491	3	6	—		
Mount Malvern Silver-lead Mining Co., N.L.	Clarendon	1,539	6	4	—		
Mount Pangæus Gold Mining Co.	Hahndorf (near)	56	1	4	—		
Mount Monster Gold Mining Syndicate	Kuitpo, Hundred of	350	0	0	1	0	0
Mt. Grainger Ironclad Gold Mining Syn., Ltd.	Mount Grainger	21	18	10	—		
Mount Torrens Gold Mining Co.	Mount Torrens	1,000	0	0	—		
Mount Remarkable Mining Co., Ltd.	Wongyarra, Hund. of	122	8	1	15	0	0
Musgrave Ranges Prospecting Association	Musgrave Ranges	47	2	0	—		
Mount Painter Corundum and Gem Syndicate	Mount Painter	47	3	1	—		
Morning Star Gold Mining Co.	Teetulpa	68	4	6	—		
Mutooroo Copper and Silver Mining Co., Ltd.	Mutooroo	500	0	0	500	0	0
Myrtle Gold Mines, N.L. (Dustholes)	Hd. Coglin	370	1	4	25	0	0
Nackara Proprietary Copper Mining Co., N.L.	Nackara	100	0	0	—		
Nackara Proprietary Gold Mining Syndicate.	"	100	0	0	—		
New Banksia Gold Mining Syndicate	Nairne	250	0	0	—		
New Alma and Victoria Gold Mining Co., Ld.	Waukaringa	3,000	0	0	3,000	0	0
New Ajax Consolidated Gold Mining Co., N.L.	"	750	0	0	—		
New Era Gold Mining Co., Ltd.	Woodside	1,000	0	0	—		
New Glenloth Battery and Mining Co., N.L.	Glenloth	750	0	0	—		
New Medora and Grainger Gold Mines Syn., N.L.	Mount Grainger	1,421	9	9	—		
New Mingary Gold Mining Co.	New Luxemburg	250	0	0	—		
New Mount Grainger Gold Mines, N.L.	Mount Grainger	393	7	1	220	0	0
Northern Mining and Smelting Co., N.L.	Mount Rose	350	0	0	11	5	0
North Nairne Gold Mining Co.	Nairne	500	0	0	—		
North-West and West Australian Pros. Co.	North-west of S.A.	104	9	7	—		
North-West Prospecting Association, N.L.	Tarcoola	150	0	0	—		
Nil Desperandum Teetulpa Devt. Co., N.L.	Teetulpa	64	14	4	20	5	6
Nilpena Copper Mining Co., Ltd.	Blinman	290	5	3	—		
Olivaster Silver-Lead Mining Co., N.L.	Hundred Yankalilla	300	0	0	—		
Onkaparinga Dredging and Mining Co., and Echunga Propy. Hydraulic Gold Sluicing Co.	Biggs' Flat	1,050	0	0	700	0	0
Paull's Consolidated Copper Propy., N.L.	Burr Well	525	0	0	17	13	0
Parara Mining Co., N.L.	Maitland	571	3	6			
Paringa Mining Syndicate	Callington	399	16	8	244	0	0

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced. £	s.	d.	Amount Repaid. £	s.	d.
Paringa and West Kanmantoo Consolidated Copper Mine, N.L.	Callington	1,144	3	4	210	5	0
Pioneer Gold and Copper Mining Syndicate	"	95	15	6	66	19	6
Polmear, W. J. L. (Poona Mine)	Moonta	800	0	0	31	0	0
Poonana Silver, Lead, & Copper Mining Syn.	Hundred Mann	137	7	10	—		
Port Lincoln Copper Co., Ltd.	Reedy Creek	800	0	0	—		
Prince Albert Mining Syndicate	Hundred Onkaparinga.	214	0	0	2	0	0
Queen Bee Mining Co., N.L.	New Luxemberg	250	0	0	250	0	0
Quorn Manganese and Silver Mining Co.	Quorn	10	9	10	—		
Rapid Bay Silver Mining Co., N.L.	Yankalilla, Hund. of	136	2	4	—		
Robertstown Bright Silver Lead Mines	Hd. Bright	170	5	11	—		
Royal Charlie Gold Mining Co.	Mannahill	153	18	5	—		
Rees, R. (Ajax Mine)	Waukaringa	604	14	5	—		
Saunders, L. E. (Great Eastern Mine)	Wadnaminga	98	10	0	98	10	0
Sixth Creek Gold & Copper Mining Co., L.N.	Sixth Creek	161	1	11	—		
Stainbank, A. T.	Fifth Creek	70	14	11	—		
Sliding Rock Copper Proprietary, N.L.	Sliding Rock	2,000	0	0	32	11	0
Tarcoola Blocks Gold Mining Co., Ltd.	Tarcoola	4,345	5	2	214	10	5
Tarcoola Enterprise Gold Mining Co., N.L.	"	100	0	0	19	10	4
Tarcoola Proprietary Gold Mines, N.L.	Tarcoola	150	4	4	9	15	0
Teatree Gully Gold Mining and Pros. Assn.	Teatree Gully	234	5	7	—		
Teetulpa Mining and Crushing Co.	Teetulpa	349	11	4	—		
Teetulpa Prospecting Syndicate	"	49	15	6	—		
Trewartha S.H. (Royal George Mine)	Tarcoola	10	0	0	—		
Tumby Bay Copper Mining Co., N.L.	Hutchison, Hund. of	800	0	0	—		
Uley Graphite Syndicate	Uley, Hundred of	210	15	0	—		
Utica Copper Mining Co. N.L.	Burra	224	16	7	109	18	6
Victoria Hill Amalgamated Gold Mining Syn.	Barossa, Hundred of	38	12	6	—		
Victoria Tower Mining Co., N.L.	Mannahill	345	18	9	90	0	0
Walton Hill Copper Mining Syndicate	Near Freeling	50	0	0	1	10	0
Warrakimbo Propy. Copper Mining Synd.	Barndioota, Hundred of	220	16	2	—		
Warra Warra Propy. Copper Mines, N.L.	Farina	322	4	11	322	4	11
Watt's Gully Gold Mining Co.	Gumeracha	50	0	0	—		
Watt's Gully Reef Claims	"	50	0	0	—		
Wolters, F. C., & Co	Echunga	25	0	0	—		
Wallaroo Central Mining Co., N.L.	Kadina	500	0	0	—		
Westward Ho Mine (Dr. H. Dixon)	Mannahill	1,000	0	0	—		
Wohler, H., & Co.	Myponga	20	0	0	—		
Wheal Turner Copper Mining Co., Ltd.	Prospecting on proposed line to Queensl'd Border	1,000	0	0	—		
Winninninnie Gold & Silver Propy. Co., N.L.	Winninninnie	86	3	6	—		
Woodside Boring and Mining Syndicate	Woodside	422	17	11	—		
Worturpa Exploration and Mining Co., Ltd.	Worturpa	800	0	0	—		
Yelta New Copper Mining Co., N.L.	Wallaroo	1,000	0	0	—		
Young Bullfinch Gold Mining Co., N.L.	Talunga, Hundred of	146	3	4	2	0	0
Totals	—	65,108	16	1	11,264	15	4

NOTES ON THE SAMPLING AND VALUATION OF PROSPECTS.

The Department of Mines, Flinders Street, Adelaide, frequently receives for assay and advice, parcels of various minerals and ores. Such a parcel may have one or more of the following faults:—

(1) It may contain a single piece, obviously picked.

(2) The quantity forwarded may be of insufficient size either for assay purposes or to properly represent the material sampled.

(3) The parcel may be unaccompanied by any statement or request showing the information desired.

(4) It may carry no marks to identify it with the letter of advice.

(5) There may be no letter of advice.

(6) There may be no declaration of the exact locality, without which free assays cannot be made.

(7) The letter of advice may contain no information as to the width or size of the body from which the material has been taken—information which may be necessary before it is possible to advise as to the value of a deposit.

THE MEANING OF THE WORD "SAMPLE."

A specimen is not a sample. A specimen shows the nature of a rock or ore; a sample is intended to show its value, and must be representative of a pile of ore or of a lode at a definite place.

A "representative" sample is a small proportion of the original bulk, containing, in unchanged percentages, all the constituents of the original lot. Such a sample gives the value of a pile of ore. The average of a number of samples, broken from the workings of a mine, represents very closely the value of the material sampled. Both broken ore and mines are, in many cases, sold on the values arrived at by sampling.

HOW TO TAKE A SAMPLE.

In sampling a lode, samples should be taken at definite intervals, and the lode should be sampled over measured widths at these localities. Widths should be measured at right angles to the lode, that is, along the shortest line between the walls.

A sample must be taken by breaking the same bulk for each foot of width. This should be done as evenly as possible over the whole width that the sample is intended to represent, and all the material that would be subsequently milled or smelted, whether rich or poor, should be included in the sample. The quantity taken might amount to one pound per foot of lode width; but the nature of the ore body and the distribution of the values (whether uniform or irregular) must be considered when deciding on the size of the sample. With uniform values the interval along the lode can be greater and the amount broken less than if the lode carries irregular values, as in the case of a lode carrying coarse gold.

THE PROPER WAY TO REDUCE THE SIZE OF A SAMPLE.

Such a sample, if of any considerable size, should then be broken into smaller pieces, well mixed, and quartered down. Quartering down means that the broken ore, after mixing, is piled into a cone on a floor or cloth, and that the cone is flattened and subdivided into four parts by two cuts at right angles. If the ore is sufficiently broken and mixed the sample obtained by taking the two opposite quarters, A A, has a value equal to the rejections B B, shown in the following diagram:—

HOW A SAMPLE SHOULD BE QUARTERED.

At each quartering care should be taken to sweep all rejections away.

By successive finer crushing and quartering, a sample, of 1lb. to 2lbs. is obtained that has the same value as the bulk first broken from the lode. This sample of 1lb. to 2lbs. should then be properly bagged, marked, and sent for assay. It would be well to enclose a specimen of 1oz. to 2ozs. of the uncrushed ore for inspection.

In reducing the large sample first obtained it is essential that the lumps of ore be broken smaller by at least half between each quartering. For example, a sample averaging, as broken, 1in. pieces, might be broken to ½in., ¼in., and ⅛in. particles before each successive quartering, to ensure uniform mixing and the even distribution of the valuable material.

THE USE OF ASSAY RESULTS.

Individual samples of standing ore may differ from the true value of the lode, but the average of a number of such samples will be very nearly that of the body of stone which they represent. Thus it will be seen that, in estimating the value of standing ore, reliance is to be placed, not on a single sample, but on the average value of a number of samples.

THE VALUATION OF BROKEN ORE.

Sampling a pile of broken ore may be done either by quartering, or by taking every second, tenth, or any other proportion of shovelfuls when shovelling the pile over, the proportion depending upon the way in which the values are distributed through the ore.

In sinking or driving on a lode, the value of the ore broken can be determined by making a separate pile with every fifth or tenth bucket of ore raised, and cutting down the small pile so made by shovelling and quartering. This procedure, if adopted, would in many cases prevent undue disappointment or the incurring of a loss through sending unpayable material to be treated.

ESTIMATION OF GOLD CONTENTS BY PANNING.

In estimating gold contents by panning during prospecting work, representative samples of constant weight or bulk should be taken. Too often a selected lump of kindly appearance is crushed, with the result that the value of the ore is over-estimated, and disappointment results when a parcel is sent to a battery. A record kept of all panning results, and the position and width of lode over which a sample is taken, will do much towards facilitating the opening up of a mineral property.

SUGGESTIONS FOR TAKING AND FORWARDING SAMPLES.

It is suggested that the following precautions be taken in sending samples for assay:—

(1) Each sample should be taken so as to be representative of the material sampled.

(2) Each sample should be properly marked so that it can be identified by the Department and by the sender.

(3) A letter of advice referring to these marks should be sent containing particulars as to—

(*a*) The exact location of the material sampled relatively to some well-known point.

(*b*) The width over which the sample has been taken.

(*c*) The depth at which it was taken.

(*d*) What valuable constituent is supposed to be present.

The Department reserves the right to refuse to make any particular assay of samples of insufficient promise or which do not conform to the conditions enumerated above.

No assays will be made of metallurgical products, and no umpire samples or materials showing free gold will be tested.

ACCIDENTS IN MINES AND QUARRIES.

A gratifying feature of our mining operations in mines and quarries is the infrequency of serious accidents; quarries are in the same category as mines as regards the control of the Department of Mines. The following table gives the number of accidents in mines and quarries during the last ten years:—

ACCIDENTS IN MINES AND QUARRIES.

Accidents in Mines.				Accidents in Quarries.			
Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.	Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.
1911	2	—	2	1911	—	—	—
1912	3	2	1	1912	2	—	2
1913	10	8	2	1913	—	—	—
1914	3	2	1	1914	3	2	1
1915	3	—	3	1915	3	2	1
1916	5	1	4	1916	—	—	—
1917	8	6	2	1917	2	2	—
1918	7	5	2	1918	2	2	—
1919	—	—	—	1919	3	2	1
1920	4	3	1	1920	3	1	2

ASSAYS AT SCHOOL OF MINES.

NUMBER OF ASSAYS MADE FOR PUBLIC PURPOSES AT THE SCHOOL OF MINES ASSAY DEPARTMENT DURING THE SIX MONTHS ENDED DECEMBER 31st, 1920.

	1920.					
	July.	August	September.	October.	November	December.
Department of Mines	55	39	44	53	112	60
Public assays	130	153	124	68	46	121
Totals.....	185	192	168	121	158	181

S.A. Asbestos and Mining Company, near Robertstown, Hundred of Bright.

Open Cut.

Dump Awaiting Treatment.

Trial Hole.

To face p. 44.]

REPORTS FORMING ADDENDA TO THE RECORD OF MINES.

REPORTS

BY

The Government Geologist (L. Keith Ward, B.A., B.E.).

NOTES ON THE RESULTS OF RECENT BORING OPERATIONS IN THE BLACK SWAMP, HUNDRED OF NANGKITA, AND THE PROSPECTS OF OBTAINING SUPPLIES OF PETROLEUM AT THIS SPOT.

Boring operations have been conducted on behalf of the Black Swamp Oil Company at a spot situated on the eastern boundary of section 267, hundred of Nangkita, and immediately to the north of the swampy ground.

The Black Swamp is a narrow strip of wet and low-lying land occupying a valley which extends for several miles in a north-westerly direction towards Mount Compass, and by which the superficial drainage of many square miles of country finds its way to the River Finniss. The swamp land is very rich in vegetable matter at the surface, and beneath this soil occur a few feet of coarse sands, gravels, and pebble beds.

Under the alluvium lies a great thickness of the Permo-Carboniferous tillite—a formation composed largely of bluish clay, but containing at this place, as elsewhere, angular, sub-angular, and rounded fragments of many different rocks. Sand grains are irregularly distributed through the clay, and in some places beds of unconsolidated sand occur. The bluish color of the clay constituting the bulk of this formation is altered by weathering to yellowish-brown near the surface.

The tillite at Black Swamp is portion of a continuous formation which outcrops over many square miles of country round Mount Compass, in the valley of the River Finniss, and in the Inman Valley. The same formation has been recognised on Kangaroo Island, at Hallett's Cove, and on lower Yorke Peninsula. Deep boreholes have been drilled through the formation into the underlying bedrock at Kingscote, Kangaroo Island; and within the boundaries of sections 415 and 581, hundred of Encounter Bay.

No petroleum, nor any carbonaceous material, was discovered in any of these boreholes; the glacial drift having accumulated under conditions which did not permit the existence of organic life. No organic deposits are known

to be included within the tillite at any point in South Australia, where no indications have yet been observed of Permo-Carboniferous interglacial climatic conditions favorable to the existence of plant and animal life.

Beneath the tillite the drill has proved, where the whole of the drift has been penetrated, the old slates, quartzites, and mica schists of Mount Lofty Ranges. These bedrocks have been much disturbed, and the upturned edges of broken crust blocks outcrop at many places round the margin of the glacial deposits. They are not known to carry any petroleum, even in traces, at any place in this State, and nowhere in the world do such rocks yield supplies of commercial value. There is a locality in California where small quantities of oil have found their way out of overlying petroliferous beds into crevices in rocks of this type; but the rocks themselves are not such as yield petroleum. (See U.S. Geol. Survey Bulletins 309 and 471.)

Above the tillite the Recent alluvial occupies the lowest part of the valleys, and the formation carries much water since it rests on an impermeable clay bottom. The pools, and slowly moving water in the Black Swamp, contain in some places films of iridescent hydroxide of iron, which seem to have been mistaken for films of oil.

The borehole just drilled to a depth of 352ft. on the northern bank of the Black Swamp, in section 267, hundred of Nangkita, has given the information that the typical boulder clay extends from the surface to a depth of 346ft., beneath which 6ft. of white siliceous sand have been penetrated. The driller has recorded "hard rock" at 210ft. In all probability this rock was one of the boulders embedded in the clay. Typical boulders, some of them being of large size, may be seen in place in the creek bed where the swamp narrows on the eastern boundary of section 264.

As far as concerns the prospects of obtaining petroleum at the site of the bore, no favorable opinion can be given as a result of the inspection of the site and the consideration of the geological structure of the region. The drilling of such a hole for oil is to be regarded as a highly speculative venture in which the chances of success are exceedingly slender.

As far as concerns references to the possibilities of obtaining supplies of petroleum in South Australia in books and reports printed in other countries, it should be borne in mind that these references are seldom to be relied upon unless the compiler has himself made personal investigations in the areas mentioned. Such publications, in giving summaries of occurrences throughout the world, draw upon sources of very unequal importance. Information with regard to occurrences in a distant country may be useful if it is based on authoritative reports, to which references should be given so that the original statements may be consulted.

From the discussion contained in these notes it will be seen that no recommendation can be made for further expenditure on boring for oil in this district at the present time. Should any indications of oil be discovered in the future in the area concerned, the question of further prospecting can be reconsidered. (13.12.20.)

With regard to the possible utilisation of the clay forming the greater part of the tillite, it may be said that no special features are shown by the results of tests performed on two samples. The clay is suitable for use in the manufacture of bricks and Portland cement. The two samples analysed were obtained during the progress of drilling operations between depths of

150ft. and 200ft., and 200ft. and 250ft. from the surface. The examination of these samples was conducted by Mr. W. S. Chapman with the following results:—

Composition.	Sample from 150ft.-200ft.	Sample from 200ft.-250ft.
Silica	62·98	72·18
Alumina	17·96	10·78
Ferric oxide Ferrous oxide	5·12	7·54
Magnesia	1·62	0·54
Lime	0·80	0·20
Soda	0·04	Trace
Potash	3·58	2·46
Water at 100°C.	0·79	0·27
Water above 100°C.	5·77	4·92
Carbon dioxide	0·29	0·08
Titanic dioxide	0·66	0·54
Chlorine	0·02	0·02
Total fluxes	(11·16)	(10·74)
	99·63	99·53

PHYSICAL PROPERTIES.

Color—		
Unburned	Grey	Grey
Burned at 1,000°C. (oxidising atmosphere)	Light-red	Blue-grey
Burned at 1,450°C. (reducing atmosphere)	Dark-brown	Black
Fusibility test at 1,450°C.	Fused; non-refractory	Fused; non-refractory

REPORTS

BY THE

Deputy Government Geologist (R. Lockhart Jack, B.E., F.G.S.).

REPORT ON THE ASBESTOS (CROCIDOLITE) DEPOSITS ON SECTIONS 2A AND 3A, HUNDRED OF BRIGHT.

These deposits, held by the South Australian Asbestos and Mining Company, Limited, are in a large bed of altered magnesian limestone dipping to the west and traceable for some miles in a N.N.W.-S.S.E. direction. Associated with this bed are asbestos, magnesite, and phosphate rock.

The holdings (claims 11167/8 and 11179/80) of the S.A. Asbestos Company cover 160 acres of this bed, and on them are two groups of workings.

The southern group on section 3A has been worked for many years by different holders, marketable asbestos being picked from the larger seams. As the workings are not very extensive and have the appearance of having followed the larger veins, and as the ground has been worked by different claim holders, it is evident that the method of hand-picking the larger seams is not the proper course to pursue.

These workings have proved an area of about an acre and have a maximum depth of 20ft., but give no indication of the average grade. This can only be determined by bulk sampling.

The asbestos on section 3A extends beyond the limits of the workings.

The recent development is on section 2A, hundred of Bright, about 60 chains to the N.N.W. of the original workings. Asbestos occurs in the intervening space.

These northern workings consist of a considerable number of shallow holes and pits to 4ft. or 5ft. deep, and a cut into the hill with a shaft 15ft. below the bottom of the cut or 20ft. below the surface.

Practically all these pits show asbestos and prove a length of about six chains. Portion of this length is covered by alluvium, but there is no doubt that the deposit is continuous beneath the alluvium. The workings show asbestos over a width of about two chains, less an apparently barren zone in the centre.

Most work has been done upon the eastern deposit or portion of the deposit. The cut to the shaft shows barren silicified rock west of the shaft, and this silicified rock, extending north and south, is the apparently barren zone. Deeper work may show it to be superficial, but until this is proved the eastern zone must be regarded as being 25ft. to 30ft. wide. It dips about 50° W.S.W.

To the west of the silicified rock and south of the alluvium a number of shallow pits show asbestos-bearing rock over a width of about a chain. The quantity present is probably as great as that in the eastern deposit, but the depth is too shallow to get the strong fibre.

The asbestos occurs as bunches, veins, and veinlets through a decomposed magnesian limestone rock in which veins and crystals of calcite are developed.

The fibre is present as an irregular mat and is extremely fine and silky and of a French-grey color. Sheaves up to 4in. long were noted, and after disintegrating a sheaf by soaking in water, fibre so thin as to float in air and up to 2in. long could be drawn out of the pulp.

The veinlets for the most part dip with the limestone, or at about 50° to the west in the shaft. The individual veins are small and it was stated that about ¼ per cent. of firsts, ½ per cent. of seconds, and a larger proportion of thirds could be recovered from the ground broken by hand-picking.

The rejects contain much more fibre than was picked and are worthy of concentration.

The firsts consist of fibre down to 1in., somewhat dirty, and can be sold at £48 per ton. The seconds consist of fibre 1in. to ¼in. and can be sold at £28 per ton. The thirds are short, somewhat earthy asbestos of normal grey color, with much short fibre, and are valued at £15 per ton. Some 4 tons to 5 tons of these grades were bagged and awaiting shipment.

The shaft and smaller pits all conveyed the impression that the material exposed, given suitable concentrating plant, was payable.

The need for plant implies that tonnage and grade be definitely proved as a preliminary, and the writer recommends that the following work be done to that end:—

(1) The north shaft be continued till footwall country is reached.

(2) A narrow trench put across the deposit from west to east.

(3) A shaft sunk on the west side, but in the west deposit to prove its grade in depth.

(4) Records should be kept in (1) and (3) of:—

(*a*) crude firsts and seconds that can be picked;

(*b*) the proportion of waste rock that can be rejected;

(*c*) the proportion of milling rock left after removal of (*a*) and (*b*).

When (2) has been completed to a suitable depth below the surface soil, the position of asbestos-bearing and barren zones will be established. If the asbestos zones are then bulk sampled by deepening the cut and dividing the product into (*a*), (*b*), and (*c*), the value of the body will be ascertainable by taking a representative bulk sample of (*c*) from each of these workings, and submitting them for testing.

Three samples were taken by the writer:—

(1) Fines from a pit 4ft. deep at the south of the eastern zone on section 2A, and

(2) Coarse rock from the same pit. (Half a bag of thirds had already been picked from this hole.)

(3) From a shot fired at the bottom of the main shaft (20ft. from surface).

Though the material taken as samples was apparently little, if any richer, than the ground exposed in the holes from which they were taken, it should be clearly understood that the results are not to be regarded as quantitative over any considerable tonnage.

The recoverable asbestos can only be determined by the method outlined above. The results only demonstrate the relative proportion of fibre and the best means of separating the material from the gangue.

Nos. 1 and 2 were subsequently combined for testing. No. 3 was tested separately.

The following remarks are condensed from the report of the Government Metallurgist on the samples:—

Nos. 1 and 2 combined sample.

Dry Treatment.—Crushed to ¼in. in rolls, graded on sieves, and fibre hand-picked with the following results:—

	Per cent.	
on ¼in. sieve	1·0	asbestos recovered.
on ⅛in. sieve	0·9	asbestos recovered.
on $^1/_{10}$in. sieve after regrinding to $^1/_{16}$in ..	1·0	asbestos recovered.
through $^1/_{10}$in. sieve after regrinding to $^1/_{16}$in. ..	4·1	of meal-like asbestos recovered.
Total ..	7·0	

the bulk of which is only suitable for paper stock.

Wet Treatment.—Crushed to ¼in. in rolls and treated in a jig followed by two settling tanks.

Recoveries.—From jig	6 per cent.	of asbestos.
From first tank ..	8 per cent.	"
From second tank	14 per cent.	"
	28 per cent.	

most of which is short, and the tank products were dirty owing to admixture of clay.

The asbestos has a remarkable property of emulsifying with water, and in dilute mixtures the gangue drops. With the jig about 150 parts of water to 1 of crude ore was necessary. The recovery was very good.

Sample 3.—A good grade sample from 20ft. in depth.

Dry Treatment.—Crushed in stages to ⅛in., sieved, and hand-picked—

on ½in. sieve	7 per cent.	of fibre and stone recovered.
on ¼in. sieve	3 per cent.	" "
on ⅛in. sieve	5 per cent.	" "
Total	15 per cent.	

Wet Treatment.—Each grade of the above dry-picked fibre was mixed with about 200 times its weight of water and the emulsion poured off through a sieve and dried.

The clean fibre so produced on the original weight of ore amounted to:—

on ½in.	6 per cent.
on ¼in.	2 per cent.
on ⅛in.	4 per cent., with a small proportion of grit

The under 8 mesh material that was not hand-picked was sieved and water treated as above.

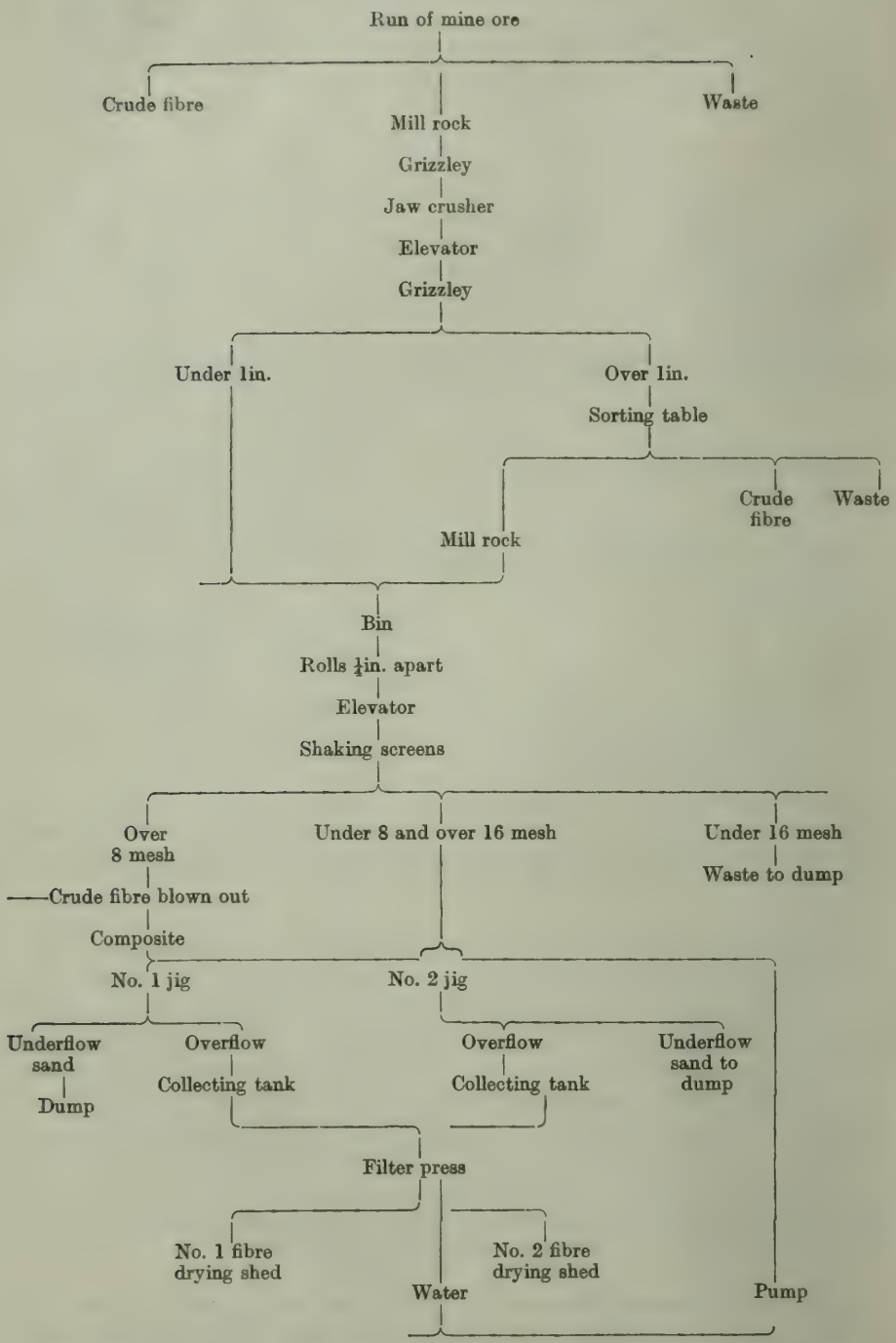
	Waste and fibre. per cent.	Fibre recovered by washing. per cent.
Through 8 on 10 mesh	19	5
Through 10 on 20 mesh	28	5
Through 20 mesh	38	rejected

Total recovery 22 per cent., of which 8 per cent. to 12 per cent. is good grade fibre of medium length; the remainder, which is shorter in staple, contained some grit.

It appears from these tests that the treatment will be a combined dry and wet process, and that a very good recovery can be made. The emulsifying of the material will require a very large storage capacity of the dilute emulsion, from which the fibre does not settle. The fibre filters easily under vacuum and some form of filter, probably a standard filter press, would be required to remove and restore to the circulation the very large volume of water necessary. Make-up water would not be heavy and would probably not exceed 300 gallons per ton of crude ore treated. The flow sheet tentatively suggested by the Government Metallurgist is as follows, but before any question of a plant is considered, tonnage and grade should be determined by the prospecting work outlined above.

At the present time all that can be said is that there is every indication of a large tonnage of payable grade being present, but a block of ore should be definitely proved for tonnage and monetary value before the expense of plant is incurred.

Probable Flow Sheet.



When tonnage and grade have been proved by further development, a further test by the Department of Mines could determine the quantity of

each grade recoverable from the average ore and the proportion of water to be handled.

The nearest permanent water is at the Burra Creek, a little less than three miles to the north, and the adoption of a wet process would involve the construction either of a tram or a pipe line. As the railhead is at Robertstown, to the south, a pipe line would seem to be indicated. The cost of a pipe line would be probably greater than that of the mill, and consequently the need for proving tonnage and grade is emphasized.

Values of the product are indicated by the price at which the hand-picked crude is being sold, and the product that can be made by washing is far cleaner.

The material is identical with the blue South African asbestos (crocidolite) and has the same properties.

The following analysis by Mr. W. S. Chapman, shows the composition of the good grade asbestos recovered by wet concentration in the above tests:—

	per cent.
Silica	53.48
Alumina	5.32
Ferric oxide	15.16
Ferrous oxide	3.44
Magnesia	10.90
Lime	.72
Soda	6.30
Potash	.70
Water at 100°C	.72
Water over 100°C	2.32
Carbon dioxide	.22
Manganous oxide	present
	99.28

The property of emulsifying and of remaining in suspension is a valuable one and should enable the shorter material to find a ready sale for building, lagging, and the manufacture of asbestos papers and felts. (2.10.20.)

NOTES ON THE EUKABY FIELD (BARATTA).

(*Vide* Review, No. 32, p. 43.)

The following notes were prepared after a visit to the field on October 19th and 20th, 1920:—

Four features became apparent on examining the field—

(1) The persistence and regularity in strike of the veins.

(2) The large number of veins.

(3) The tendency of veins to have hanging and footwall portions, separated by a persistent formation of slate usually too low in lead to be considered as ore.

(4) The uniformity in width and the small average width of the ore—as distinct from the ore and slate formation measured as a whole.

In any stoping the slate formation will generally have to be broken and used for filling, while the vein or veins on hanging and footwall are broken separately.

Some of the veins contain oxidised ore, much of which is in very friable form, and such as cannot be hand-picked to shipping grade will inevitably yield a very poor percentage of extraction on mill treatment. Fortunately, sulphide ores predominate.

To arrive at an estimate of what constitutes payable ore on the field, the following assumptions and calculations were made for concentrates of 60 per cent. and 70 per cent. of lead, with half an ounce of silver per unit of lead; and with lead at £36 per ton, and silver at 4s. 8d. per fine ounce.†

	Per Ton of Concentrates Containing—	
	60 per cent. lead 30ozs. silver.	70 per cent. lead 35ozs. silver.
	£ s. d.	£ s. d.
Smelter treatment charges	8 10 0	10 0 0
Cartage to Carrieton	3 0 0	3 0 0
Railway freight	0 10 0	0 10 0
Total charges	12 0 0	13 10 0
Gross value	27 3 0	31 14 0
Net value on field	£15 3 0	£18 4 0

Gold in excess of 1dwt. per ton will add to the net value at the rate of not less than 84s. per fine ounce.

If the case of a lode carrying an average width of 12in. of ore—as distinguished from non-millable slate formation—be considered, a block of 100ft. by 100ft. would contain approximately 800 tons of ore.

It may reasonably be assumed that the development of such a block would involve 100ft. of shaft or winze sinking, and 100ft. of driving. Costs of sinking at the field are about £4 per foot, and driving should be done for £3. These figures appear high for the class of ground and should permit of reduction.

Costs may be assumed for 800 tons as—

	£
Development	700
Breaking and raising, 30s. per ton	1,200
Cartage to mill, say 2 miles (2s. 6d.)	100
Milling, 10s.	400
Total	£2,400*

or £3 per ton.

This indicates that up to 5 tons of ore from a body a foot wide can be mined and milled to get a ton of 60 per cent. concentrate, or that the ore must yield 12 per cent. of lead, and contain by assay say 14 per cent. of lead.

† Metal prices at time of inspection.

* No allowance has been made for standing and overhead charges, as their cost per ton depends on the rate of working the deposit.

For 70 per cent. concentrates six tons of ore can be mined and milled and the grade would be $\frac{70}{6}$ per cent. of 12 per cent. of lead equivalent, allowing for higher extraction loss, to say 15 per cent. by assay. These figures must be understood as applying only to galena ore containing half an ounce of silver per unit of lead, which assay results show to be the approximate average ratio of lead to silver for this particular district.

It is thus apparent that a 12in. body must contain about 14 per cent. of lead, in prill and milling ore, to pay its way; and that with lesser widths the grade must increase almost inversely with the reduction in width.

Wider lodes will save on development and breaking costs, but not on the other items, and can work on a somewhat lower grade.

To supply ore for one shift per day, and 300 days per year, at the rate of 10 tons per day, would mean the working out of a block averaging 12in. of ore to a depth of 100ft. and a length of 400ft.

From the description of the principal workings seen on the field it will be noted that the veins are generally small, and that while some of them yield a considerable proportion of high grade ore, there are others that contain essentially milling ore, that is ore of 14 per cent. or more, calculated on the basis of a 12in. body. The richer veins will yield a proportion of seconds that can only be treated by milling.

On the present state of development, no ore is so blocked out as to be "ore in sight," that is ore developed on three or four sides which can be measured and sampled; and but little more can be regarded as "probable ore," that is ore so developed on two sides as to be accessible for measurement and sampling.

The nearest cases are where a trench along the outcrop has been made and a shaft sunk, both on ore.

The bulk of the ore present must be regarded as "possible ore," that is ore developed on one side only, either in a shaft or by outcrop prospecting.

Estimation of such "possible ore" depends upon the behaviour of the class of ore body and how far it may reasonably be expected to continue. In many cases, in calculating reserves in well developed and large mines "possible ore" is not taken into account as a tonnage factor at a greater distance than 50ft. from the points where last seen.

In the case of the Barratta field the veins themselves are likely to be persistent in depth, as they are in length, but little is yet known as to the longitudinal and vertical extension of the payable shoots which alone can be considered as ore reserves. There is the impression given of a fair tonnage of "possible ore" throughout the field, but as this is based entirely on the assumption that ore of the grade visible in some places extends some distance, it is evident that until the programme of shaft sinking now in progress and the unwatering of other shafts is carried out, and driving along the course of the most promising of the veins has disclosed a reasonable tonnage of ore for a mill, it would be premature to erect such a mill at a cost of £2,500 to £3,000. There should be enough ore definitely in sight to keep it running for a year at 10 tons per 8-hour shift, with prospects of developing more ore during that year.

The future of the field depends on the results of the development being carried on, the reduction of road carriage costs, the possibility of reductions in treatment charges, and the future of the metal market.

Mineral Claim 11315 (M.R. 6809).

Covering old workings on former mineral claim 10681, the Eukaby Blocks. Four shafts have been repaired here. The northernmost sunk to a depth of 161ft. to 170ft. reached water level at 114ft. Fragments of ore and screenings on the dump indicate that some ore has been sent from here, and preparations are in hand to unwater the shaft. The Record of Mines, 1908, states that at 120ft. there are fine veins of galena exposed in a width of lode [or formation] of 8ft. The gangue is quartz, limonite, and slate, and the shaft underlies about 75° to the south.

Five chains south a vertical shaft, of 60ft. depth, has been repaired, and 40yds. north-west of this a new pit 6ft. deep and 4ft. wide exposes slate dipping 80° to N.N.W. In this slate are veins of ferruginous material aggregating 6in. in width. About half a ton of fair grade ore has been recovered from these veins.

Five and six chains south of the vertical shaft two old shafts, 60ft. and 40ft. or 50ft. deep, have been sunk on veins underlying to the northward.

SILVER PRINCE AND SILVER KING.

Mineral Claims 11295, 11296, and 11297 (M.R., 1585/7).

The open cut referred to by the Government Geologist in Review 32 has been carried somewhat farther, and an adit extended about 40ft. The ore body varies from 6in. to 2ft., and from the last 23ft. of driving 4 tons of good grade galena and about the same quantity of "seconds" have been won.

The ore continues in the face and underfoot, and as the adit is extended there will be a quantity of ground available for stoping overhead. It is proposed to sink on this body of ore.

The lode is not visible on the surface as its strike of S. 70° W. is followed over the hill, but at the western end of the hill an excavation shows 2ft. of galena-bearing lode, apparently of payable grade. Another shaft is to be sunk here (The Silver King Claim, 10296). A hundred yards farther on to the W.S.W. the lode shows as a 6in. seam, containing probably 15 per cent. to 20 per cent. of galena, and this can be traced a farther distance to the W.S.W.

The recovery of ore at the adit and the appearance of the western exposure justify sinking at these points.

The former working was yielding 1 ton of bagging ore and 1 ton of milling ore (10.2 per cent.) per square fathom of lode.

THE SILVER QUEEN, 11342 (M.R. 6811).

This claim of 40 acres adjoins the Silver King on the W.N.W., and the principal work is the sinking of a shaft 42ft. on a lode dipping about 55° to the N.N.W. The lode consists of a thin hanging-wall vein and a footwall vein of 6in. to 12in. thick, with an intervening slate formation 12in. to 18in. thick.

The vein consists of quartz and ironstone, with cerussite, some pyromorphite, and splashes of galena. The indications on the surface and in the shaft are that there is a shoot of ore just to the W. of the shaft, and the shaft is to be sunk to 50ft. and the lode driven on at this depth. This work will give an indication of the value of the lode.

BARATTA IMPERIAL SILVER-LEAD MINING COMPANY, NO-LIABILITY.

Mineral Claims 11291, 11292, 11313, 11314, and 11316.

(M.R. 6813, 6814, 6806, 6807, and 6810.)

An old vertical shaft, about 140ft. deep, N. 32° E. from Eukaby Hill, on mineral claim 11292, has a drive to the west at 30ft. about 10ft. long. In this drive the lode is stated to carry good lead, silver, and gold. The shaft evidently penetrated the lode, and from this and the drive there remain about 30 tons of low-grade rejects, consisting of quartz and iron carbonate and oxide. The present workers have picked a quantity of galena from this material. There is no record of what quantity was originally obtained. The depth of this shaft and the steep dip of the lode indicate the advisability of crosscutting and driving on the lode at the bottom.

To the W.S.W. and presumably on the same line some small openings have been made, and about 6 tons of medium grade (40 per cent. to 50 per cent.) shipping ore have been recovered. Beside these workings a shaft is being sunk to a depth of 100ft. The open cut to the W.S.W. is an old working which crosses 30ft. of fissile decomposed slate, containing veins and splashes of carbonate of lead and galena. Old drives in either direction follow the most brecciated portion of this 30ft., and show the greatest proportion of lead. The formation as a whole is very low grade, but in view of its large size, may become a producer when the carbonate gives way to galena, which will be more amenable to concentration. The new shaft now in progress, or workings from it, should determine this point.

Another lode (the New Find) has been discovered on the south slope of the ridge on which these workings occur, and the soil has been stripped over a width of 8ft. to 15ft. Over this width patches and veins of lead ore occur. About 5 tons of milling-grade ore have been recovered in cleaning the outcrop to a depth of 2ft. A portion of this width consists of brecciated slate cemented by limonite and quartz, and carrying some galena. This brecciation is typical of a persistent lode channel, and this occurrence should be further prospected both longitudinally and vertically.

Mineral Claim 11353 (M.R. 2500).

A pit near a N.E. fence exposes 30in. of lode material at a depth of 6ft. The lode is typical in its gangue, and appears to be above the milling grade.

Mineral Claim 11343 (M.R. 6832).

This claim includes the old West Eukaby shaft, in which water level stands at about 60ft. A fair amount of low-grade ferruginous quartz is present on the dumps, and a few tons of high-grade lead ore have been recovered from this and from an outcrop trench to the west. Up to 6in. of clean galena was visible in this trench. The lode dips to the south at a steep angle.

Mineral Claim 11327 (M.R. 7245).

The Eukaby Extended shaft on this claim is apparently on the same vein as the West Eukaby, which bears S. 69° W. from it. From the shaft, which is about 100ft. deep, a good deal of low-grade ferruginous quartz and ankerite has been taken, but only a trifling amount of milling-grade ore is present on the surface.

BARATTA SILVER-LEAD MINES.

Mineral Claims 11294, 11256, 11299 (M.R. 7237, 6479, 7238).

Proceeding from the E.N.E. to the W.S.W., the first working seen is an old shaft 62ft. deep, from which good ore is reported to have been taken at 24ft. and 60ft. The lode dips 80° S., and very little low-grade gangue is left on the surface. This vein has in the past been tested by other shafts and outcrop trenches to the W.S.W.

A new and parallel lode has been exposed to the north and some distance to the west by a cut 30ft. long and 10ft. deep. It shows a body from 9in. to 12in. wide of fair ore, consisting of galena, ironstone, and some quartz. Shipping ore is being obtained here, as well as milling-grade material.

Seven and a half chains W. 5° N. from here still another vein, striking N. 65° E., is being opened. This is the site of the discovery that led to the rejuvenation of the field.

A shaft has been sunk to 20ft. from the brace, and an underhand stope carried west to a depth of 16ft. for a length of 40ft. The shoot is pinched in the western face, but the eastern ground is untouched except for a pit about 6ft. deep at the site of the first discovery, and from which 2 tons of galena have been taken. The intention is to sink on the lode to 100ft. and drive.

The stope shows two veins, that on the south or hanging-wall averaging 9in. of good ore, and the footwall vein 4in. to 6in. of galena and ironstone. The intervening ground, 12in. to 18in., is slate formation and not ore.

Thirty-two and a half tons of high-grade ore have been shipped from the Baratta Silver-Lead Mines, and 21 tons have come from this stope and 2 tons from the hole at the site of the original find. Very little second-grade ore is recovered here, the galena being massive and separable. There are some tons of shipping ore raised at the various workings.

West Workings.

The vein is exposed at intervals for about half a mile W. 25° S. as far as a larger excavation known as the west workings on Mineral Claim 11299 (M.R. 7238). This excavation is about 10ft. deep, and shows veinlets of ankerite, limonite, and galena, and bunches of galena in a slate formation. About 3ft. in width is of milling grade, and 7.65 tons of high-grade ore have been shipped from this excavation and from a cut on a parallel vein 30ft. S. in similar but softer country. Some small veins are known between these two bodies, and it is proposed to sink on one to 100ft. and crosscut to the other, thus testing the intermediate veins.

Mineral Claims 11264, 11265, and 11266. (M.R. 6660, 6661, 6662.)

Two veins have been opened on M.R. 6660. The first, at 7 chains W. 9° N. from the S.E. corner of the claim, is in a pit 10ft. deep, exposing 9in. of quartz, ironstone, and galena, the whole being apparently rich enough to be regarded as milling ore. A parallel vein 30ft. further north has been sunk on to a depth of 18ft. at a point W.S.W. 4 chains from the first pit. The vein of ore (quartz and galena) is 6in. in thickness, and though small, is apparently rich enough to mill, with recovery of a proportion of high-grade shipping ore by hand-picking.

The claim to the W.S.W. of this group has had a considerable amount of work done on a persistent and very regular vein of banded quartz and

ironstone carrying a little galena. The vein is very regular, ranging from 3in. to 6in. thick, and so far nothing of consequence has been disclosed by the work done.

South-east of the Siccus River a considerable number of claims have been pegged on veins similar in type to those north-west of the river. The country here consists of thin-bedded slates dipping 45° to the N.W., and the veins, striking with the bedding, dip across it.

Mineral Claims 11432, 11433, 11434. (M.R. 7256, 7255, and 7029.)

A shaft sunk 35ft. at a dip of 80° follows a quartz and carbonate vein ranging from 6in. to 12in. in thickness. Cerussite and a little galena are present. There is a smaller footwall vein separated from the other by a slate formation.

Mineral Claim (M.R. 7066).

A vein striking N. 50° E., dipping 75° to the S.E., has been sunk on to a depth of 15ft. The vein ranges in width from 9in. to 12in., and consists of quartz, ankerite, limonite, and a little cerussite and galena. Half a ton of galena is reported to have been recovered during the sinking.

Mineral Claim 11346. (M.R. 6748.)

On this claim a shaft about 10ft. deep exposes a very regular vein of banded ankerite, quartz, and limonite with galena. The galena is distributed through the stone, and it is a milling ore rather than one from which much shipping ore can be picked. The vein is about 9in. to 12in. in thickness.

Mineral Claims 11466, 11467, 11468. (M.R. 7267/68 and 7276.)

A pit 10ft. deep exposes veins of 4in., 6in., and 2in. of ironstone, quartz, and carbonate of lead, dipping 70° S.E. across the bedding of thin-bedded slates dipping N.W. 45°. (11-11-20.)

REPORT ON FURTHER WORK AT THE MOUNT CRYSTAL BARITE MINE.

Sections 577, 576, and 575, Hundred of Para Wirra.

(*Vide* Review No. 30, page 32.)

The open cut on section 577, which was about 4ft. deep, and showing 8ft. to 9ft. of barytes when last seen, has been deepened to 15ft. The lode has pinched to about 3ft., 4ft., and 5ft. in width, being widest in the eastern end, and a vein of barytes runs into the north side a short distance back from the face. With the diminution in width the central 4ft. of good quality barytes has died out, and the bulk of that exposed in depth is much contaminated with specular haematite. This mineral is distinctly showing in the schistose walls as lamellar fillings in the planes of schistosity. Work here has been abandoned owing to the quantity of haematite present in the stone.

The southern lode, on section 575, has been opened a few yards north-west of the opening seen previously and driven on for about 10ft. at a depth of 9ft. below the surface. The body shows about 4ft. of solid barytes and a foot of barytes and country. The barytes is superficially stained yellow with iron, and much of it contains laminae of specular haematite oriented with

that in the schist walls, and probably included in the barytes when the latter molecularly replaced the schist. The superficial stain being secondary will disappear in depth, but the primary haematite will persist. At the south-eastern end of the lode, in the gully, some workings, now filled up, disclosed yellow-stained barytes.

The original cut on the crest of the hill has had further work done in it, and some of the barytes being broken at a depth of 7ft. or 8ft. is of excellent quality, the balance contains haematite. It appears probable that with careful picking a very high-class material can be got, but the grade will depend entirely upon the care exercised in picking the stone. It is proposed to sink on the hanging wall side of the lode and go vertically until the cleanest barytes is in the shaft and then turn and follow it on the underlie. (17.11.20.)

REPORT ON OCHRE LEASE.

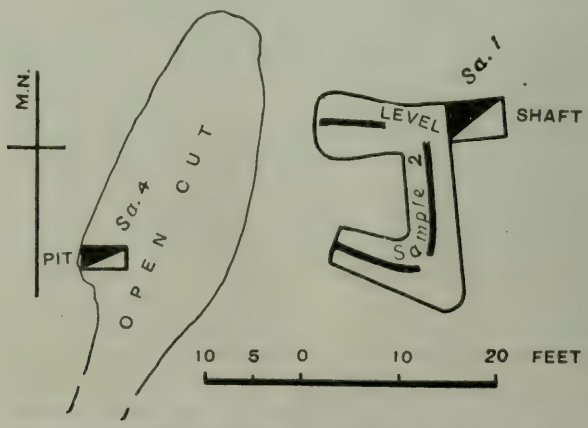
M.L. 2408 AND 2409, SECTION 83, HUNDRED OF COGLIN.

These leases cover a large outcrop of limonite, formerly worked for flux, and an old shaft sunk during the flux mining proved the existence of a large body of yellow ochre. The shaft has been repaired and cleaned out to the bottom (108ft.) and a U-shaped drive put in at 98ft. deep for a total length of 37½ft. The shaft and the drive expose ochre so soft as not to require explosives, but the eastern end of the shaft shows a harder yellow limonite.

In the shaft and in the drive, patches of very pure white fine-grained sugary and unconsolidated quartz up to a foot in diameter occur. The larger patches and the adjacent ochre are thrown out in mining, but the small ones are not rejected in raising the ochre and were not separated in the cutting of the following samples. It is stated that about a quarter of the material broken is rejected owing to the quantity of silica present.

Sample No. 1 was taken from the bottom of the shaft, on both sides.

Sample No. 2 was cut from the roof from end to end of the drive, excepting two sections of 5ft. and 1ft. long where the cut crossed patches so siliceous as to be rejected as waste. A little micaceous iron is present, and the silica is present in the form of specks and blebs of granular quartz for the most part, though a little occurs as veinlets.



Plan of Working, Showing Position of Samples.

S.A. Asbestos and Mining Company, near Robertstown, Hundred of Bright

To face p. 60.]

Open Cut.

Trial Hole.

No. 4 sample was taken from the bottom of an old opencut, exposing a considerable quantity of yellow ochre, but not in such a continuous body as is represented by sample 2. Situated 40ft. W. 20° S. from, and 30ft. below the collar of the shaft, the exposure in the open cut affords, in conjunction with the section down the shaft, proof of the continuity of the body from 30ft. to 108ft. below the collar, or 78ft. total depth.

The following analyses are by J. D. Connor, Government Metallurgist, who notes that the samples are practically identical with the original sample tested in April, 1919, in color and composition, and that they have not more than 1 per cent. of hygroscopic moisture.

	No. 1.	No. 2.	No. 4.	April, 1919.
	Per cent.	Per cent.	Per cent.	Per cent.
Loss on ignition	9·6	7·2	10·4	7·5
Silica (SiO_2)	36·3	46·75	37·35	45·4
Alumina (Al_2O_3)	1·3	1·72	3·84	
Ferric oxide (Fe_2O_3)	52	45·19	48·5	47·6
	99·2	100·86	100·09	100·5

Tonnage.—The limits of the ochre at the 98ft. level have not been reached in any direction except at the east end of the shaft, where the limonite, though of good color, is hard. The 98ft. level has blocked out 345 sq. ft., and the open cut to the west of the shaft exposes irregular bodies that approximate 225 sq. ft. Assuming, as is reasonable from the evidence in the shaft, that the body extends from open cut to shaft bottom, a distance of 78ft., the cubic content is 21,580ft. Of this the experience of the drive shows that one-quarter can be rejected as siliceous, leaving 16,000 cub. ft. of ochre, equivalent, at 12 cub. ft. to the ton, to 1,330 tons. Further development will doubtless increase this tonnage to a very considerable extent, as the limits of the body are not exposed to the west, south, or north. The output from the drive has been 15 tons shipped away, 27 tons bagged, most of which is roasted, and 8 tons loose, a total of 50 tons.

The yellow ochre, after sieving, has been roasted on the mine in a shallow pan for the production of a red ochre. It is proposed to instal a more efficient roaster, as fuel is comparatively cheap on the mine, and the cost of carriage is reduced, and to fine-crush the red oxide in a mill being erected at Kilkenny.

The samples taken by the writer when fine ground gave a yellow ochre of the same shade in each case. On roasting, the ochre changed to a red with a tinge of brown, and all were very uniform. No. 2 gave slightly the best red. Compared with a finely-ground high-grade English ochre, valued locally at £50 per ton, the local material showed a brownish tinge, which, however, was barely apparent until a direct and close comparison was made. With care in the rejection of the more siliceous portions of the body in mining, a better system of calcining and possibly elutriation at the grinding plant, a very high-grade product can be made. As it is, the quality of the ochres produced is such as to command a market that must increase when a regular output is attained and the ochres become better known. (24-12-20.)

NOTES ON THE WORKINGS OF THE ULEY GRAPHITE SYNDICATE AT SECTION 2AE2, HUNDRED OF ULEY.

(*Vide* Reviews Nos. 28, 30, and 31.)

The writer visited this lease on December 13th, 1920.

The stripping of overburden to enable the ore-body, proved in No. 3 shaft crosscuts, to be worked by open cut was in progress. The excavation, 140ft. square on the surface, and designed to expose the central 50ft. square at a depth of 15ft., had reached a depth of 6ft. to 8ft., where it is about 90ft. square. At or above this depth a hardpan of impure siliceous magnesite has formed and impeded the ploughing and scooping of the overburden. The deeper workings show that this crust does not persist in depth, but boring proved that it is at least 3ft. in thickness.

In the southern corner of the excavation high-grade milling ore, free from iron, is exposed for a width of 10ft., and this zone, though not so fully exposed elsewhere, can be traced in a north-easterly direction the full length of the cut.

Ninety feet north-west, good-grade ore, somewhat contaminated by limonite and ochre, is exposed, and at a few feet deeper this zone will be of milling grade also. Between these two zones the hardpan crust is very prominent, but graphite is visible in the crust and in the ends of the excavation, and leaves no room for doubt as to the essential continuity of the ore-bearing zone for a width of 90ft. at least. There may, of course, be zones too low grade to mill, but apparently a width of at least 90ft., the bulk of which will be ore, can be mined by open cut.

As the estimate of tonnage in Review No. 31 was based on the ore-body having a width of 50ft., the distance penetrated by the crosscuts, neither of which passed through the ore, and a length of 50ft., it is at once apparent that a very considerable additional tonnage may be expected from the greater width now proved and by the continuation along the strike. Furthermore, this estimate was based on the possibility of all the material within 25ft. of the surface being overburden, and the stripping has shown that there is a proportion of ore to be won between 8ft. and 25ft. from the surface. Thus the indications of greater width and a lesser proportion of overburden to ore can only be regarded as exceedingly satisfactory. In view of the presence of the hardpan and of ore fit to mill, it is evident that the present system of stripping is no longer suitable, and further work at this spot should be deferred until the mill is being erected. Then the construction of an incline from the mill-bin to the 37ft. level of No. 3 shaft, and the utilisation of the shaft as a pass will enable the ore, waste, and overburden to be broken and raised selectively and the cost of handling to be reduced to a minimum.

A site was chosen for a new shaft to prove the extension of the lode to the S.W. The site selected is 125ft. W. 28° N. (mag.) from No. 7 shaft, and is about 165ft. along the line of the ore-body from the vertical plane passing through the No. 3 shaft crosscuts.

This new shaft is designed to pass through the lode and to cut the foot-wall at a depth of 60ft., at which depth a N.W. crosscut could be driven to prove the width.

The successful outcome of this development work would add very largely to the measurable ore reserves.

The choice of a site for a well, to supply treatment water, at a point 30 chains N. 8° E. from No. 3 shaft was re-examined and confirmed. (4-1-21.)

REPORTS

BY

The Chief Inspector of Mines (L. J. Winton, B.E.).

THE ADELAIDE BARYTES SYNDICATE.

This mine is situated about 2½ miles from Noarlunga, or 23 miles from Adelaide, on sections 92 and 93, hundred of Willunga, the lode extending across a road between the two sections. There are four shafts on the property, that on section 93, nearest the road, having been used as a main shaft, from which the lode has been stoped for about 100ft. in length. The barytes lode ranges in thickness from 2ft. to 12ft., and strikes N.E.-S.W., dipping S.E. at about 50° on the whole. The country that the lode occurs in is soft white and yellow clay slate.

Towards the N.E. end of these workings the lode contracts and the barytes is considerably stained, but the main part of the lode shows a large amount of white opaque barytes of excellent color and purity. Some portions of the lode are stained with iron to some extent, and are set aside as seconds, the amount of this material on the surface being about 200 tons. On section 92 two shafts are sunk to a depth of 50ft., and driving is in progress to connect them at that depth. Work so far has been partly by open cut and partly by ordinary stoping, sufficient waste being obtained in stoping to fill the stopes as they progress.

BARYTES MINE, ALDGATE.

This property is situated on the recreation ground, Aldgate, and has been worked for some years. Up to the present the lode of barytes, which outcrops on the side of a hill, has been worked by two adits at different levels, but a shaft has now been sunk to a depth of 40ft. below the former workings, and driving on the lode has been commenced. The lode is nearly vertical, and is showing a width of 4ft. near the bottom of the shaft, the strike being about N.W. by W. The barytes is of good quality as regards purity and color, and occurs in masses in the lode, requiring but little explosives for its removal. An oil-driven winch is to be provided for hauling purposes.

BARYTES SHOW, SECTION 90, HUNDRED OF WILLUNGA.

A barytes lode is being prospected on this section close to the road. The total thickness of the lode is 4ft., of which the upper 3ft. is solid barytes, the lower portion showing slate and barytes mixed. The lode strikes N.E.-S.W., and dips S.E. at an angle of 35°, and is contained in light yellow clay slate country. The lode has been exposed for a depth of 8ft. so far, and the barytes is much iron-stained, but sinking will be carried on to a depth of 25ft. or 30ft. to ascertain if the amount of iron stain will decrease with depth.

REPORT ON THE SNOWFLAKE SYNDICATE BARYTES PROPERTIES.

Situated on private property, sections 82 and 102, hundred of Willunga, a little to the south-east of the town of Noarlunga.

Section 82.

The barytes lode that has been prospected here occurs in the S.E. corner of the section. It has a general strike of N.E.-S.W., and dips to the S.E. of an angle of 63°, being enclosed in bleached clay slate. Several shallow holes have been sunk on the lode, from which about 7 tons of first-grade barytes have been obtained and sold, the width of the lode as disclosed in these excavations being from 20in. to 24in. The barytes is of the opaque white variety, and is of good color and quality, with but little iron stain, and a large proportion of first-quality material should be obtained from this lode.

Section 102.

The lode prospected here averages about 2ft. 6in. in width, the strike being N.N.E.-S.S.W., and the dip, which is to the S.E., changes from 45° near the surface to 60° as the depth increases. A shaft has been sunk on the lode, following its underlie to a depth of 50ft., and a little driving has been done at the bottom.

The enclosing country is purple and grey slate, and the lode appears to strike and dip with the slate. In the upper portion of the lode the barytes is, in places, of a brownish hue, and there are iron-stained faces visible in parts, but the general mass of the lode is of good white color and quality, and should yield, with a little dressing, a high proportion of first-quality material.

It is proposed to sink a vertical shaft to cut the lode at about 50ft., and to be connected with the present underlie shaft for ventilation purposes. It was noticed that numerous thin clay partings existed in the lode, and by driving in on the soft slate on the footwall side of the lode, and taking advantage of these partings, it should be possible to obtain the barytes in large masses with but little expense for explosives.

About 42 tons of barytes of first quality have been sold from these workings. (7-1-21.)

NOARLUNGA BARYTES COMPANY.

This property, formerly known as Shepherd and Murphy's, is situated on section 101, hundred of Willunga. The lode strikes N.N.E.-S.S.W., and dips S.E. at about 70°. The workings here are mostly open cut, although in one place a shaft has been sunk to a depth of 40ft. The barytes lode is showing very wide in the bottom of the open-cut workings, which are about 60ft. deep, the average width probably being from 6ft. to 8ft. A certain amount of iron stain occurs with the barytes, which is dressed and cleaned for sale.

AUSTRALIAN SLATE QUARRIES, LIMITED.

Situated about two miles south of the Willunga railway station (*vide* Reviews Nos. 14 and 31). These quarries, which had lain idle for some years, were acquired by another owner some time ago, and work has since been carried on continuously. The roofing slate is being obtained from a

pit now about 50ft. in depth below the floor of the old quarry, and a certain amount of flagstone is also being obtained and sold. The present owners are now making preparations to build a large slate and flagstone dressing-plant to be driven by steam power, and have considerably increased their holding of ground. A pneumatic drill is in use in the quarry for boring holes to enable the blocks of slate to be broken out in suitable masses by means of gads, no explosives being used in getting the roofing-slate, and the new plant will provide compressed air sufficient for a number of these hand-pneumatic machines. With the present plant the owners state that they are unable to comply with the demand for the slate. The industry at present employs 24 men at the quarries, getting and dressing slate, and roofing slates of all sizes are produced, as well as flagging slate, used for kerbing, &c.

MINTARO SLATE AND FLAGSTONE COMPANY, LIMITED.

This company has been quarrying slate near Mintaro (*vide* Mining Review No. 20) for many years, the quantity available being very great, the belt of slate having not only a great thickness, but also considerable longitudinal extent. No roofing slate is obtained, the cleavage not being sufficiently fine to enable thin slates for this purpose to be obtained, but this absence of fine cleavage makes the slate specially suited for flagstones and other purposes, as it does not scale with wear. The slate is well suited for hearths, sills, steps, kerbing, shelves, cricket pitches, troughs, tanks, vats, billiard-table tops, ledgers and vault covers in monumental work, slabs for lavatories, paving flags, switchboards, blackboards, &c.

The company specialise in wine-fermenting tanks, chemical-resistant tanks, and petrol-storage tanks, and slate has been supplied to the Victorian schools for use as blackboards. The general run of the slate sold for various purposes ranges in thickness from half an inch to 3in., according to the purpose for which it is required, and the size of the slabs that can be obtained is limited only by facilities of transport.

The old Nos. 1 and 2 quarries are not being worked now, but No. 3 quarry is in use, and the stripping of the surface soil is in progress in order to open up a new quarry, No. 4, north of and practically adjoining No. 3. The two oil engines formerly used to furnish power for the slate-dressing mill have been discarded, and an 85 h.p. suction gas engine is now in use. The slate slabs are quarried by hand labor and split off by feather and plug work, no explosives being used, and are then landed on the surface by a 10-ton steam crane. A very large stock of slabs is kept always on the surface seasoning, and from this stock any suitable slabs of slate for the different requirements can be obtained. The plant in use consists of three sets of sawing-machines, with mild steel blades, the cut being fed with water, and beach sand from Glenelg; a planing machine used for "nosing" the slate, also for truing up slates; and two rubbing tables, large revolving horizontal iron discs, up to 12ft. in diameter, upon which the slabs of slate can be ground to a smooth and plane surface by means of water and sand. The suction gas engine drives this plant, and in addition there is the steam 10-ton crane, also several hand cranes and a 7 h.p. oil engine driving a pump for water supply. The company's horse teams transport the slate slabs on the surface and to the Merildin railway station, 82¾ miles distant from Adelaide. About 25 men are employed on an average. This company also has a branch department in Melbourne, with a slate-dressing plant, where 13 or 14 men are employed.

THE NEW BURRA COPPER SYNDICATE.

(*Vide* Reviews 16, 18-22, 28.)

The New Burra Copper Syndicate, formerly known as the Utica, have commenced work again, and are continuing the sinking of the new underlie shaft, which is now down to a depth of 93ft. It is being sunk on the lode, which dips to the S.W. at an angle of 63°, and has a width of 4ft. The lode is quartz carrying a small amount of copper minerals throughout. There is a drive on the lode at the 100ft. level of the old workings, and the new shaft should connect with this very shortly.

REPORT ON THE LIGNITE DEPOSITS OF THE HUNDREDS OF SHERLOCK AND SEYMOUR.

(*Vide* Reviews Nos. 13 and 32.)

The existence of lignite in this locality has been known for many years, wells and bores put down in search of water having proved its existence. The lignite is not known to outcrop anywhere in this area, and its presence must be established by sinking or boring. The deposits so far investigated lie in close proximity to the Pinnaroo railway line, and the more westerly portion of the area would be served by the Elwomple railway station, 81¾ miles from Adelaide, while for the eastern portion, Moorlands railway station, 86¾ miles from Adelaide, is the nearest point. Elwomple is 6½ miles, and Moorlands is 11½ miles, from Tailem Bend, a railway town situated on the Murray River. The surface of the country is gently undulating, consisting of travertine, or sand which sometimes overlies the limestone, and may form low sandy ridges. The limestone ranges in thickness from a few feet to 14ft., and its average thickness over a large portion of the area is about 8ft. Beneath the travertine formation there is a limestone containing fossil shells and casts of shells, below which is generally found a green glauconitic sand formation, followed by white or colored clays overlying the lignite. Above the lignite is sometimes found a dark pyritic sandstone. Pyrite occurs in the lignite in different amount, sometimes showing in large quantity, and was also seen associated with fossil shells above the coal. The lignite is generally of a brown color, and shows the woody structure plainly; it contains globules of resin and the shales show fossil leaves, and a few small water-worn quartz pebbles were noted in the coal. Seams and patches of bright jetty lignite show occasionally in the deposit.

The deposit is mostly below water level, and is saturated with water when mined, the water being generally very saline; when brought to the surface and exposed to the air, the fuel checks and cracks, tending to fall to pieces, but when mined it is tough and capable of being obtained in large pieces. As mined, it is mostly too wet to burn in open grates, and requires a certain amount of drying before combustion, and when burning it gives off a rather disagreeable odor, which would possibly militate against its use for domestic purposes, unless completely removed by a strong draught.

A very considerable area has been taken up in the search for lignite, extending from the south-eastern portion of the hundred of Seymour, across the boundary into the hundred of Sherlock for more than half its extent.

In using the term lignite the classification used by the United States Geological Survey has been followed, which recognises two grades below bituminous coal, namely, sub-bituminous (such as Leigh Creek) and lignite.

Brown coal and lignite are terms often used as synonymous, but a distinction is made by an English writer on coal, E. A. N. Arber. He defines lignite as a deposit in which the dominant constituent consists of wood so little altered that the form and structure are evident on inspection, and brown coal as a dark-brown or black compact fuel, which does not show any obvious evidence of woody structure, and is therefore farther advanced towards true coal than lignite.

The lignite deposits are of Tertiary age, and their horizon in this system has been determined by the evidence of the fossil beds overlying the lignite. A collection of fossil shells and casts of shells was obtained from these overlying beds, and was sent to the National Museum, Melbourne, where by the courtesy of the Director of the Museum, the fossils were identified and assigned to their proper horizon by the Palæontologist, Mr. F. Chapman. Two stratigraphical horizons were represented by the fossils, viz., the Kalimnan, or Lower Pliocene, and the Janjukian, or Miocene. Amongst others, a true Janjukian form, Pecten cf. præcursor Chapman, was represented by a cast of a part, and another fossil of restricted Janjukian form, Venus (Chione) multitæniata, was also determined. The Kalimnan horizon was represented by forms of Ostrea and Venus (Chione) subroborata. The lignitic deposits are therefore of Janjukian age (Miocene), and are, of course, very much younger than the Leigh Creek sub-bituminous coal, which is of Jurassic age.

Hundred of Seymour.

In this hundred, a little south of the Pinnaroo railway line, there are some blocks held on part sections E, F, and G on which lignite has been proved to exist. One shaft near the middle of the N. boundary of section E entered the lignite at a depth of 27ft., and is stated to be still in it at a depth of 45ft., showing a thickness of 18ft. as far as it has gone. About 8ft. of limestone occurs near the surface. At a depth of 30½ft. from the surface the lignite has been driven on for a few feet, the quantity obtained having been sent away for purposes of trial. There are about 3ft. of lignite above the back of the drive. The deposit as seen in the drive appeared clean and of good quality, without excess of pyrite, and without shale bands, and a sample was taken from the sides of the drive (Sample No. 1).

Several bores have been put down at various points on the blocks, and one of these is stated to have shown 15ft. to 20ft. of lignite; another to have traversed 15ft. thickness and to be still in it; and another, about 12 chains north of the shaft, to have cut lignite at a depth of 30ft. and to be still in it at 38ft. From this last bore, No. 6, it is stated that the coal is "dry," and will burn as obtained. In view of the irregularity of the deposit, as shown by boring in various parts of the field, the boring on these blocks is neither close nor systematic enough to enable an estimate to be made of the amount of lignite present. For this purpose, further boring could be done, the bores being put down at the corners of squares of suitable size, starting, say, from the shaft where lignite is known to occur, and working out from it. The prospecting so far is mostly confined to the two northern blocks.

To the north of this property, about half-way between it and the Pinnaroo line, there is another shaft which has been sunk into the lignite deposit, but

judging from the material on the dump, it is here of an inferior nature, showing a considerable amount of admixed shale, and a very large quantity of pyrite in lumps and nodules, and would apparently be useless as fuel. There being no ladders or appliances, the shaft could not be inspected. Eastward from this, to the common boundary of the hundreds, there has been some work done on Block 268 (Moorlands South), five bores having been put down. It was stated that Nos. 2, 3, and 4 were unfinished, owing to want of casing to penetrate loose sand; that No. 1 cut 5ft. of lignite between the depths of 45ft. and 50ft.; and that No. 5 bore cut the lignite at a depth of 44ft. and was still in it at 54ft.

North of this block is Block 246, adjoining the boundary of Sherlock, belonging to Moorlands Central Company. Here a line of bores about 10 chains apart, put down in a westerly direction across the block from the hundred boundary, and about a quarter of a mile north of the railway line, gave no indication whatever of the presence of lignite. Still farther north, on the boundary of Sherlock, in the S.E. portion of section 4B, there is a block, No. 223, on which some prospecting work has been done without success. Several shafts and bores were put down to different depths, only one of which is stated to have shown a little lignite of poor quality. This block adjoins the Tailem Bend Coal and Oil Company's property on the western side.

Hundred of Sherlock.

The greater portion of the area held lies in this hundred, and the greatest amount of work has been done here. The Tailem Bend Coal and Oil Company, No-liability, hold two leases here, mineral sections Nos. 1234 and 1233, each of which are on the common boundary of Seymour and Sherlock. The most northerly of these blocks is in the north-east corner of Sherlock, close to its boundary with the hundred of Hooper. The shaft, originally sunk for water, in which lignite was cut, is on the southern block, No. 1233.

A considerable amount of work has been done on this block, in shaft sinking and boring, and the work is sufficient to enable an estimate of tonnage to be made. Twelve bores have been put down, and several shafts, one of which is now being used as a main shaft for getting the lignite. The bulk of the work has been done on the southern block 1233, on which the main shaft is situated. A bore, No. 9, and a shaft, in the southern part of the north block, were not successful in proving lignite.

The following statement of the boring operations on the Tailem Bend Company's property was kindly furnished by the manager:—

No. of Bore.	Depth of Bore.	Overburden.	Thickness of Lignite.
	Ft.	Ft.	Ft.
1	105	44	45
2	98	37	27
3	78	—	Nil
4	101	43	16
5	110	49	57
6	Incomplete	62	9 still in lignite
7	94	43	24
8	97	49	33
9	98	—	Nil
10	99	44	43
11	62	24	31
12	Incomplete	26½	9 still in lignite

In addition to these, four other bores were put down on the eastern boundary of this block, where it joins the Murray Coal and Oil Company, Limited, these bores thus serving both companies. The results of these are as follows:—

No. of Bore.	Depth of Bore.	Overburden.	Thickness of Lignite.
	Ft.	Ft.	Ft.
8	—	78	33
9	—	69	40 still in lignite
9A	—	57	27
10	—	Incomplete	—

The main shaft has been sunk close to No. 5 bore, and a level has been opened up at a depth of 66ft. A drive extends in an easterly direction for 32ft., from which at 11ft. from the shaft another heading has been put in for 27ft. in a south-easterly direction, and another drive extends 30ft. from the shaft in a south-westerly direction. These workings are all in solid lignite, which appears to be free from shale and does not show an undue amount of pyrite.

Samples were taken here from each face, and a section of 13ft. of lignite exposed in the shaft was sampled in two sections. Water level is lower than the lignite exposed at this shaft, and no pumping is needed to keep the workings dry.

The Murray Coal and Oil Company, Limited, holds a large area of ground, principally in the hundred of Sherlock, and on portion of this area systematic boring is being carried out, and a main shaft is being sunk in a favorable position. Lines have been laid out running north-south and east-west, at intervals of 300 yards, and at the corners of the 300yd. squares thus formed bores are being sunk, supplemented by some extra bores in places. A statement of the results of these bores was kindly furnished by the manager, and is as follows:—

No. of Bore.	Depth at which Shale was Cut.	Thickness of Shale.	Thickness of Coal.
	Ft.	Ft.	Ft.
A1	41	44	21
A2	45	21	?
A3	33	18	Nil
A4	44	35	1
A1A	42½	31	12
A28AA	45½	24½	8
8	42	30	33
9	34	32	40
9A	33	23	27
10	—	Incomplete	—
C0	37½	28	33
C1	18	33	33
C2	34	22	Nil
C3	12	½	Nil
C4	28	7	10
C5	25	7	Nil
C6	25½	½	12
C7	15½	Nil	Nil
C1A	23½	15	20
C16	22	18	1 still in coal
C17	—	Incomplete	—

Statement of Bores—continued.

No. of Bore.	Depth at which Shale was Cut.	Thickness of Shale.	Thickness of Coal.
	Ft.	Ft.	Ft.
C18	23	15	Nil
C19	11½	18	½
C20	40	11	1½
C21	19	16	20
C22	22	12	1
C38	—	Incomplete	—
C39	30	12	Nil
C41	38	28	Nil
C55	36	17	Nil
C56	34	82 still in	?
C59	34	14	Nil
B1	—	Incomplete	—
B1A	45	50	25
B2	—	Incomplete	—
B3	—	Incomplete	—
B4	48	34	19¾
D1	Bedrock without shale or coal		
D2	Bedrock without shale or coal		
D3	Bedrock without shale or coal		
D12	Bedrock without shale or coal		
D13	Bedrock without shale or coal		
D14	Bedrock without shale or coal		
D15	Bedrock without shale or coal		
D16	27	2	4
D17	17	5	Nil
D15AA	19½	2½	20½
D16AA	27	2	6
D16AAA	27	2	7
D25A	21	2½	Nil
D25	18½	4	Nil
D26	23	2	Nil
D27	23	5	4
D28	24	4	10

The boring on the field has so far been done with a jumper chisel-bit for drilling the harder material and an auger-bit for the softer shale and lignite. The above table shows the results of the boring at the time of inspection, and operations are still being carried on. A shaft was being sunk close to the borehole known as No. C0, but had not reached the coal at the time of inspection.

Some other companies, the Moorlands Coal and Oil Company, the Moorlands East Coalfields, No-liability, and the Moorlands South Coal and Oil Development Company, No-liability, hold blocks in various parts of the field, and exploratory work, mostly in the nature of boring, is being carried out; many blocks are also held by private individuals, on some of which prospecting by boring has been or is being carried on. On a portion of section 7, hundred of Sherlock, to the west of the mineral section No. 1259, is a bore known as the Hawksnest bore, which is stated to have penetrated lignite from a depth of 86ft. to 111ft. A shaft was being sunk close to this bore, but was only down to a depth of 15ft. at the time of inspection. Another bore, No. 7, about 500yds. south of the Hawksnest, is stated to have proved lignite between the depths of 80ft. and 90ft.

On part sections 7, 8, and 71, hundred of Sherlock, lying to the south and east of the mineral section 1259, a number of bores exist, of which the following particulars were given to the writer.

No. 1 Bore.—Cut lignite at 109½ft. and showed 19½ft. of clean lignite.
No. 2 Bore.—Depth 120ft., stopped at present, in lignitic clay, no lignite so far.

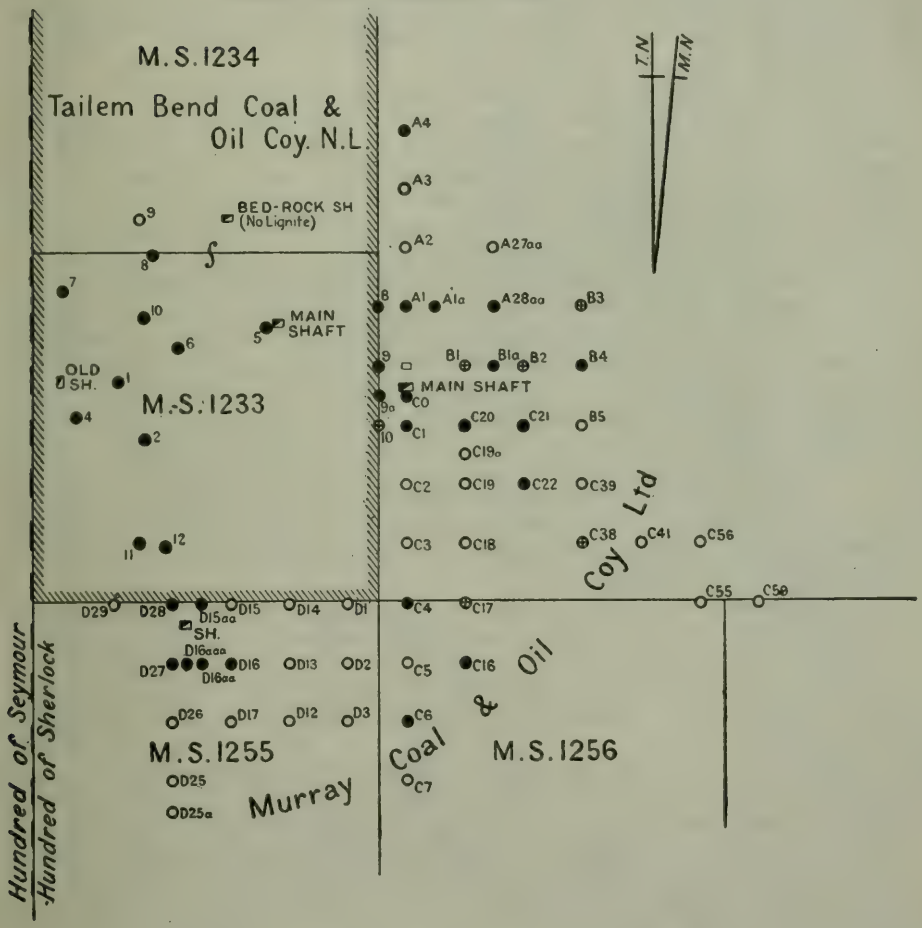
No. 3 Bore.—Depth 70ft., stopped at present in lignitic clay, no lignite so far.

PLAN SHOWING
Location and Numbers of Bores and Shafts
ON PROPERTIES OF
The Tailem Bend C & O Coy N.L and The Murray C & O Coy.

SCALE
CHS 0 10 20 30 40 50 CHS

Bores in Lignite _ _ _ _ _ _ _ _ shown thus ●
Bores in less than 1ft or No Lignite " " ○
Bores unfinished _ _ _ _ _ _ _ _ " " ⊕

TAKEN FROM COMPANIES' PLANS



No. 4 Bore.—Depth 40ft., unfinished, no lignite yet.
No. 5 Bore.—Depth 20ft., unfinished, no lignite yet.

In section 6, hundred of Sherlock, on the blocks lying south of the southern boundary of mineral sections 1255 and 1256, some bores have been sunk, the results of which are stated to be as follows:—

Two bores put down on the block south of and adjoining mineral section 1255 are stated to have proved no lignite. Four bores are stated to have been sunk on the block south of and adjoining mineral section 1256, of which No. 1, depth 114ft., proved no lignite; No. 2, 5 chains west of the above, is down 28ft., no lignite; No. 3, about 600yds. north of No. 2, is 65ft. deep, without lignite; and No. 4, 124ft. deep, shows no lignite.

On section 48, hundred of Sherlock, towards the south-east corner of the section, there is a bore which yields potable water, and which is said to have penetrated lignite at a depth of 180ft. A little to the north-east of this well a bore has recently been sunk to a depth of 110ft., but no information was available regarding its results. Near the eastern boundary of section 35, hundred of Sherlock, Allen's windmill bore is said to have cut lignite at 110ft., and lignitic clay is said to have been cut at a depth of 210ft. in a bore on section 39, still further east in the hundred of Sherlock.

It will thus be seen that the bulk of the work done so far on the field consists of boring, and that there are but few exposures of the lignitic deposit where it can be seen and sampled in shafts and workings, and the results are mainly useful in showing the extent and thickness of the deposit. Several additional shafts are now being sunk, however, in places indicated as suitable by boring, and further information as to the quality of the lignite in various parts of the field will then be available.

From the information supplied of the results of the boring, it would appear that the lignite occurs, not as a seam of fairly uniform thickness, but as a series of basin-like deposits, thinning out towards the edges of the basins, and that as a whole the lignite appears to dip somewhat to the eastward. Water of a saline nature occurs in the workings, water level being generally near the top of the lignite, although in the case of the Tailem Bend Company's main shaft the workings are above water level, but the inflow in general is not heavy, and can be readily controlled.

In regard to the question of the depth at which the lignite occurs in the country adjacent to the present field, the evidence yielded by various Government bores drilled in search of water is interesting, and the following may be enumerated:—

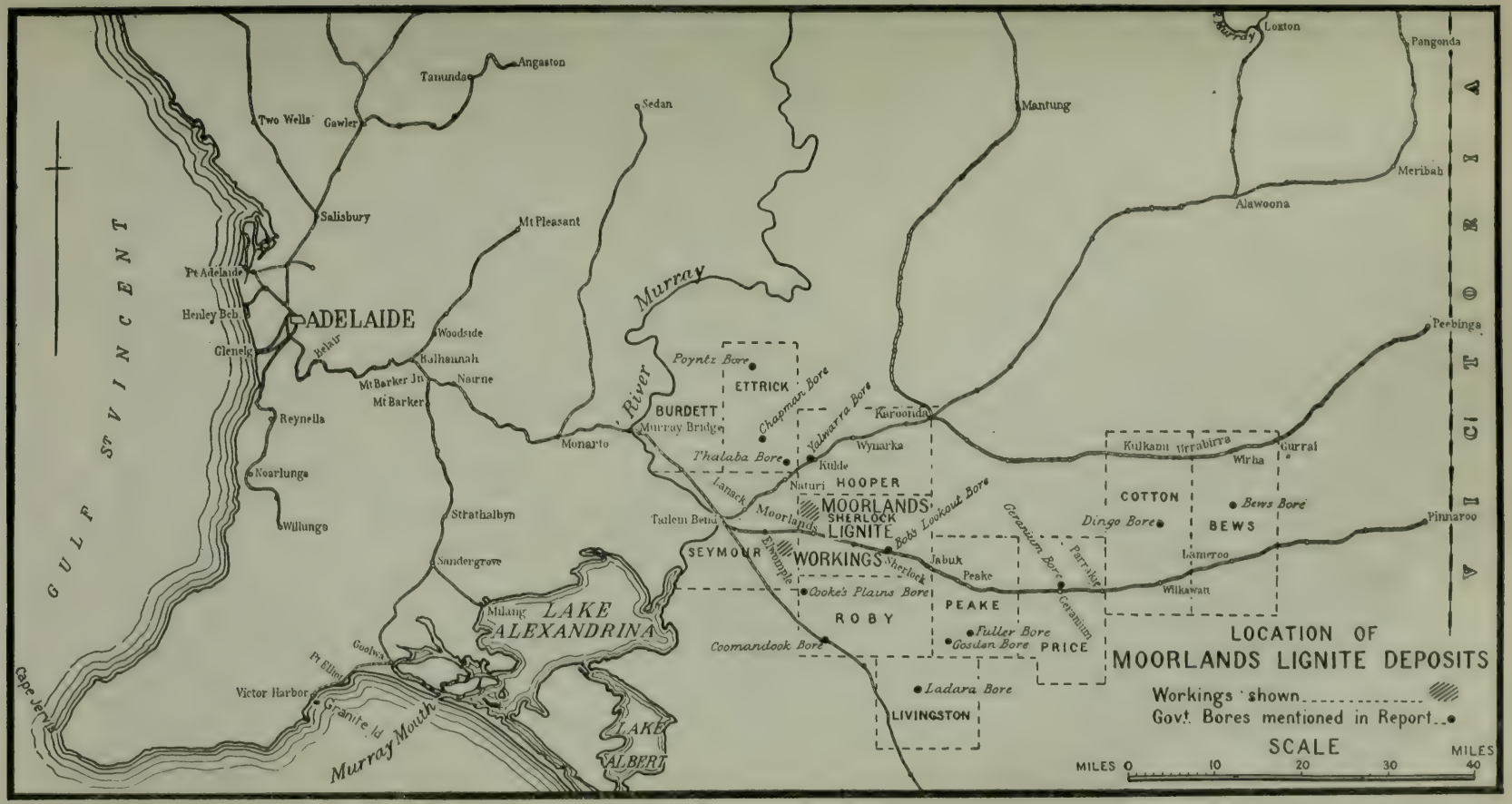
Chapman bore, hundred of Ettrick, 12 miles N.N.W. from Moorlands railway station, cut "dark clay" at 212ft., bedrock at 272ft., no lignite reported.

Thalaba bore, hundred of Ettrick, 12 miles N.W. from Moorlands railway station, cut "brown clay" at 370ft., bedrock at 410ft., no lignite reported.

Yalwarra bore, hundred of Hooper, 9 miles N.N.E. of Moorlands railway station, cut clay 160ft. to 231ft. from surface, and did not reach bedrock; no lignite was reported, but possibly the bore was not deep enough.

Sherlock (Bob's Lookout) bore, hundred of Sherlock, about 9 miles east of Moorlands railway station, passed through "clay and lignite" between 177ft. and 270ft., bedrock not being reached at a depth of 283ft.

Coomandook bore, hundred of Roby, 13 miles E. of S. from Moorlands railway station, passed through "ligneous clay" from 221ft. to 241ft., followed by 7ft. of coralline limestone and 3ft. of sandy clay, after which at 251ft. a thickness of 79ft. of "ligneous clay" was passed through, the bore finishing at a depth of 412ft. in sandy clay.


GULF ST VINCENT
ADELAIDE
Port Adelaide
Henley Beach
Glenelg
Belair
Woodside
Balhannah
Mt Barker Jn
Mt Barker
Nairne
Mt Pleasant
Salisbury
Two Wells
Gawler
Tanunda
Angaston
Sedan
Reynella
Noarlunga
Willunga
Strathalbyn
Sandergrove
Milang
LAKE ALEXANDRINA
Goolwa
Port Elliot
Victor Harbor
Granite Id
Cape Jervis
Murray Mouth
LAKE ALBERT
Murray River
Monarto
Murray Bridge
BURDETT
ETTRICK
SEYMOUR
Poyntz Bore
Chapman Bore
Yalwarra Bore
Karoonda
Thalaba Bore
Kulde
Wynarka
Naturi
HOOPER
MOORLANDS
SHERLOCK
LIGNITE
WORKINGS
Lansell
Moorlands
Tailem Bend
Elwomple
Boots Lookout Bore
Sherlock
Jabuk
Peake
Cooke's Plains Bore
PEAKE
ROBY
Coomandook Bore
Fuller Bore
Gosden Bore
PRICE
Ladara Bore
LIVINGSTON
Geranium Bore
Parrilla
Geranium
COTTON
Dingo Bore
BEWS
Bews Bore
Lameroo
Pinnaroo
Wilkawatt
Kulkami
Yerrabirra
Wirha
Gurrai
Peebinga
Alawoona
Meribah
Pangonda
Loxton
Murray
Mantung
LOCATION OF
MOORLANDS LIGNITE DEPOSITS
Workings shown
Govt. Bores mentioned in Report
SCALE
MILES 0 10 20 30 40 MILES
SOUTH AUSTRALIA

Cooke's Plains bore, hundred of Roby, to the south of Moorlands railway station, passed through "black clay" from 168ft. to 214ft., and entered bedrock at 218ft.

Geranium bore, hundred of Price, about 30 miles E. of Moorlands railway station, finished in limestone, at a depth of 171ft., no lignite or lignitic material having been reported, the bore possibly not having reached the lignite horizon.

Gosden bore, hundred of Peake, about 22 miles S.E. from Moorlands railway station, passed through "black clay" from 220ft. to 303ft. and "lignite" from 341ft. to 360ft., finishing in the latter.

A bore in the hundred of Cotton, 40 miles E. of Moorlands railway station, cut 4ft. of "dark clay" at a depth of 660ft., followed by 16ft. of gray sand and pyrites, followed by 10ft. of "dark clay." Below this were beds of black clay and shale of different thicknesses, and 6ft. of "gravel and lignite" at 814ft. depth, bedrock (granite) being entered at 852ft.

Ladara bore, hundred of Livingston, 22 miles S.S.E. from Moorlands railway station, showed sandy clay between 80ft. and 90ft. and again between 200ft. and 250ft. It finished at a depth of 290ft., in fossil limestone. No black clay or lignite was reported, but probably the bore was not deep enough to reach the lignite horizon.

Fuller bore, hundred of Peake, 22 miles E.S.E. from Moorlands railway station, passed through "black clay" between 240ft. and 310ft., followed by 30ft. of brown clay, and finished at a depth of 360ft. in shells and clay. Possibly the lignite horizon was below this.

Poyntz bore, hundred of Ettrick, 20 miles N.N.W. of Moorlands railway station, cut 52ft. of "clay and lignite" at a depth of 258ft., and finished at a depth of 352ft. in "hard shale and pyrites."

A bore in the hundred of Bews, about 50 miles E. of Moorlands, finished at a depth of 350ft. in fossiliferous limestone, no lignite or dark clay reported. Possibly the bore is not deep enough to reach the lignite horizon.

The evidence of these bores goes to show that the lignite horizon is closer to the surface in the Moorlands locality than elsewhere, and that although lignitic deposits may be found over an extended area, the depth at which they occur, or may be expected to occur, is considerably greater than at Moorlands.

It is also evident that owing to the irregular nature of the deposits, close and systematic boring is necessary in order to arrive at an estimation of quantities, and as the deposit appears to vary in different parts, as regards the amount of dirt or shale and pyrites present in it, it is necessary that proper samples should be obtained from as many parts of the field as possible to obtain an idea of its average value. Without the use of a specially-suitable boring plant these samples can best be obtained from exposures of the lignite in shafts.

Estimation of Quantity.

In the case of the Tailem Bend and Murray companies, sufficient boring has been done to enable an estimate to be made of the quantity of lignite which can be assumed as having been shown by this work.

Mineral section 1233, the southern block of the Tailem Bend Company.—Assuming an area of 1,800 square chains, as proved by the boring, taking the thickness of the deposit as 25ft., assuming this to be all of good quality, and taking 80lbs. to the cubic foot as an approximation to the weight of the lignite as it stands in the bed, the tonnage would be, in round figures, 7,000,000 tons.

On the Murray Company's block, adjoining mineral section 1233 on the east, an area of 1,200 square chains may be assumed as proved by boring, and taking the thickness as 24ft., assumed to be all of good quality, and the weight of the lignite in position as before, the resultant tonnage would be 4,400,000—say 4,000,000 tons.

These estimations of tonnage are based entirely on bore records supplied by the companies. Boring is still being continued on the Murray Company's property, and no doubt farther extensions of the lignite deposit will be proved.

It appears likely from the information so far obtained that the mining of the lignite would have to be by ordinary underground methods. The irregularity of thickness of the deposit militates against the idea of open-cutting, even where the deposit lies nearest to the surface, and elsewhere the same irregularity, together with the greater depth of the deposit, is unfavorable, for in both cases the ratio of overburden removed to lignite exposed would probably be unduly high.

Taking the case of the Tailem Bend Company's southern block, which is about the most favorable for open-cutting according to present information, and rejecting the unfinished bores or those showing no result, the average thickness of overburden is 41.6ft. and the average thickness of lignite is 34.5ft.

Assuming the weight of the overburden, a mixture of limestone and clay, to be 131lbs. per cubic foot, and the lignite, in position, to weigh 80lbs. per cubic foot, then 2.4 tons of overburden have to be removed to obtain 1.2 tons of lignite, or two to one. In addition to this, extra overburden would have to be removed to provide a safe batter for the sides. The calculation also assumes that the whole 34.5ft. of lignite is of good quality. If, however, as is very likely, the whole thickness of lignite recorded in the bores is not suitable for use, owing to presence of shale, etc., the amount of overburden to be removed for each ton of lignite obtained would be still further increased.

The quantity of water making is not excessive, and could be readily controlled, care being taken that the discharge of the mine water should not be too close to the workings, allowing the water to return to them too readily by percolation through the ground.

No supplies of fresh water are available on the field, and provision would have to be made for such. At present it is understood water is being brought for domestic use from Tailem Bend. Timber is not very plentiful, but a supply of pine can be obtained locally or in the near vicinity. This is used at present for timbering the shafts.

Analysis of Samples.

No. 1 sample was taken from both sides of a short drive in the lignite off a shaft sunk in section E, hundred of Seymour. The sample represents a thickness of 5½ft. of lignite, from which some few tons of lignite have been sent for experimental purposes. The remainder of the samples come from the Tailem Bend Company's shaft and workings on mineral section 1233, southern portion of section 53, hundred of Sherlock.

Sample No. 2 is from the face of a N.E. drive from the shaft, distant 32ft. from the shaft, and represents a thickness of 6ft. 5in. of lignite.

Sample No. 3 is from the face of a 27ft. drive off the N.E. drive, and represents a thickness of 5ft. 10in. of lignite.

Sample No. 4 is from the face of a 30ft. drive which has been put in a westerly direction from the shaft, and represents a thickness of 5ft. 10in. of lignite.

Sample No. 5 was taken from approximately the top of the lignite deposit, as it is exposed in the shaft, to the back of the drive, and represents a thickness of 7ft. 2in. of lignite. When sampling this section some bands of shale were noticed, which account for the high ash result.

Sample No. 6 was a continuation of this cut, from the back of the drive to the bottom of the drive, and represents a thickness of 5ft. 10in. of lignite. The thickness of lignite is stated to be 57ft. in the vicinity of this shaft, but the thickness of 13ft. sampled by Nos. 5 and 6 was all that was exposed and could be sampled. The samples were put into air-tight containers when cut, and those analyses marked "undried" therefore represent the fuel as it stands in the mine, or as mined. The analyses marked "air dried" represent the same samples exposed to the air until the loss of weight by natural drying becomes constant. The analyses are by Mr. W. S. Chapman, School of Mines, Adelaide.

TABLE I.—ANALYSES OF LIGNITE, AS MINED.

Sample No.	Thickness Represented.	Moisture at 105°C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
	Ft. In.					
1.....	5 10	45·86	21·30	16·35	16·49	Not done
2.....	6 5	49·00	28·74	15·02	7·24	Not done
3.....	5 10	50·44	27·65	15·07	6·84	Not done
4.....	5 10	50·56	27·26	14·86	7·32	Not done
5.....	7 2	39·53	18·52	8·52	33·43	Not done
6.....	5 10	48·96	26·15	15·66	9·23	Not done

TABLE II.—ANALYSES OF LIGNITE, AIR DRIED.

Sample No.	Thickness Represented.	Moisture at 105°C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
	Ft. In.					
1.....	5 10	16·59	39·99	19·22	24·20	4·91
2.....	6 5	18·59	40·84	28·94	11·63	3·29
3.....	5 10	17·02	41·27	30·27	11·44	3·33
4.....	5 10	18·74	40·29	28·99	11·98	3·75
5.....	7 2	17·00	24·16	12·61	46·23	2·85
6.....	5 10	16·47	40·56	28·91	14·06	3·74

It will be noted that No. 1 sample is high in ash, but it must be remembered that this is a single sample from one locality in the hundred of Seymour, and many more samples would need to be taken before any idea of the average value of the lignite could be obtained. Of the other samples, No. 5, taken from the upper part of the lignite deposit showing in the shaft, was noted while sampling, to contain shale bands, which cause the high ash content shown in the analysis. This portion of the deposit was not being mined, and samples Nos. 2, 3, 4, and 6 represent the lignite which is being mined. The average of these analyses (air-dried) is as follows:—

Thickness Represented.	Moisture at 105°C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
5·9ft.	17·72	40·74	29·28	12·26	3·52

Possible Methods of Utilising the Lignite.

These have been discussed in a former report, but may be briefly recapitulated.

(1) The generation of power for industrial purposes, either using the fuel as mined, or in pulverized form.

(2) The generation of producer gas from the raw fuel.

(3) The manufacture of the fuel into briquette form.

(4) The low temperature carbonization of the fuel with recovery of by-products.

Of all schemes for utilising this fuel, the generation of power at a suitable place, as close as possible to the source of supply of the fuel, seems the most promising. If converted into electrical energy this power could be transmitted over a considerable area, Adelaide itself being within reach. Industrial enterprises might also be established in close proximity to the field, and could either use electrical energy from a general power-house, or might possibly generate their own power, burning the fuel either in pulverized form, or in the rough, in boilers specially designed for the purpose.

One thing seems certain, that there is little chance at present of bringing the lignite itself to Adelaide to compete with imported coal, and the object to be aimed at is its utilisation as near the source of supply as possible, thus cutting out all possible expense in carriage and freight.

Ample water supply would probably be required, the nearest place for which would be at Tailem Bend, on the River Murray. This town is situated on the main line joining Melbourne and Adelaide, and is the junction of the Pinnaroo and other railway lines which serve the country south of the River Murray. Rail traffic from the the South-Eastern parts south of the Southern railway line also passes through Tailem Bend, going towards Adelaide. With the abundance of limestone and clays and shales in close proximity to the lignite deposits, the local manufacture of cement suggests itself as a question, the feasibility of which might be inquired into.

The whole question concerning the use of these or similar lignitic deposits is an economic one. This fuel has to compete on business lines with imported coal of good quality, and in order to establish itself, it must, in any of the ways in which it may be used, in substitution for imported coal, at least equal, if not show a profit over, the use of such coal. The freight and other charges on the imported coal are in favor of the use of the lignite, but the fuel value of the lignite, which must be reckoned as not more than half that of the imported coal, is against it, as it means that 2 tons of lignite at least, must be mined, handled, and used as the equivalent of 1 ton of imported coal. The necessity of having specially-designed fire-grates for burning the lignite in the rough also entails extra cost, for imported coal can be burned to advantage in any ordinary boiler, while lignite cannot. The use of the lignite in a powdered form appears to be the most successful method of burning it, and brings it closer to the heating value of imported coal used in the rough, but this entails the cost of a pulverising plant, which, of course, would be equally suitable for pulverising imported coal, which would thus preserve its relative advantage over the lignite in heating value.

As regards the mining of this lignite, as far as can be seen at present, it will have to be mined by the ordinary underground methods, and will therefore have no advantage in that respect over imported coal, and the main advantage to be relied on is the cutting out of the freight and handling charges which now have to be paid on imported coal. Remembering that all costs, mining, handling, and freight have to be paid on 2 tons of lignite at least, as against 1 ton of imported coal, it is evident that the advantage given it by the freight and handling charges on the imported coal is not very great, and this means that the fuel, to be of economic use, should be used at or in close proximity to the locality that it is obtained from, in order to cut freight and handling charges down to the minimum.

Of late years there has been a large increase in the price of coal landed in South Australia. This is due both to an increase in freights and to an increase in the price of the coal itself.

The following figures, kindly supplied by the Chief Storekeeper of the Supply and Tender Board, show this increase:—

	s.	*d.*	
Between July, 1912, and July, 1914, prior to the war, the total cost of Newcastle coal landed in trucks at Port Adelaide, including freights, handling charges, &c., was	18	6	per ton
During 1918 and 1919 the total cost of Newcastle coal landed at Port Adelaide ranged from 26s. 6d. to 40s. per ton, averaging	31	5	per ton
In 1920 the price of coal at Newcastle increased from 16s. to 17s. 9d., and the total cost landed at Port Adelaide ranged from 29s. 9d. to 41s. 5d. per ton, averaging	37	1	per ton
Recently it is understood that a further amount of 4s. per ton is to be added to the price of coal at Newcastle.			

This constant increase in the price of imported coal is, of course, tending to improve the prospects of utilising suitable lignite deposits in this State, not so much by the increase in the actual price of the coal, for that would probably be somewhat the same for any coal mining, as by the increase in the freight and charges connected with the importation of coal.

To sum up briefly, on the evidence available:—

(1) It seems likely that there is a large tonnage of lignite available.

(2) Most, if not all of it, will probably have to be mined by ordinary underground methods.

(3) To be of economic use, its conversion into power must be at a point as conveniently close to the source of supply as possible, the question of water supply also being taken into account. (3-11-20.)

LIGNITE AT NOARLUNGA.

A shaft 50ft. deep, sunk about 14 years ago in a gully on section 80, hundred of Willunga, close to Noarlunga, penetrated a deposit of lignite, and some boring was done by the Government in the vicinity (Record of Mines, p. 347, and Reviews No. 7, p. 15.; No. 8, p. 14; and No. 9, p. 17).

Shaft in Lignite—Section 80. Hundred of Willunga, close to Township of Noarlunga.

Barytes Workings, Adelaide Barytes Syndicate—Section 93, Hundred of Willunga.

To face p. 78.]

This shaft has recently been unwatered for examination. The lignite occurs as a bed 13½ft. thick, with a band of brown shale 10in. thick extending through it at a height of 6½ft. from the bottom. There are thus two divisions of the bed, the upper one a little over 6ft. thick, and the lower one 6½ft. thick, separated by the band of waste. The top of the bed lies beneath a covering of about 32ft. of rather friable and clayey sandstone. Some work has been done in the lower portion of the bed, drives having been put out east and west from the shaft. From the west drive two short headings go north; the nearest to the shaft is said to have connected with the bottom of an old well, now filled in. The heading farthest west is mainly in the lower division of the lignite bed, and a sample was obtained here of the lower 6ft. of the bed, commencing immediately below the shale band. This sample, placed in an air-tight container, was analysed by Mr. W. S. Chapman, with the following results:—

Analysis of Lignite as raised.

Water at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.
46.49	25.32	18.44	9.75

Analysis of Lignite, air dried.

Water at 105° C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
8.04	42.71	33.90	15.35	5.31

The easterly drive from the shaft is said to be 90ft. in length, but only a few feet were open, the remainder being filled with an inflow of clayey sand, evidently from the overlying clay sandstone softened by water. From the shaft the lignite bed appears to dip both to the east and to the west. The material underlying the lignite is a grey lignitic shale.

The upper portion of the bed is stated to contain rather more ash than the lower portion, but there were no facilities for sampling it. The lower portion appeared to be clean, solid lignite, of a brownish color, showing the woody structure, and with a little resinous matter and some pyrites in places. Water level in the shaft is at the top of the lignite. In the event of any working being done where the lignite is below water level, it will be necessary to leave a roof of lignite to support the overlying clay sandstone, which, if exposed below water level, will probably disintegrate. Some specimens were obtained showing small seams of bright jetty lignite, such as are seen associated with the ordinary brown lignite in most deposits.

REPORTS

BY

The Inspector of Mines (H. Jones).

WALLAROO MINES.

Examination of workings. (4-9-20.)

IRON KNOB AND HUMMOCK HILL.

Detail examination of workings and appliances. (26-11-20.)

BROKEN HILL ASSOCIATED SMELTERS, PORT PIRIE.

Examination of machinery and plant. (29-11-20.)

MOUNT CRYSTAL BARYTES MINE.

Vide also page 46. The workings were examined and considered safe. (2-12-20.)

Reports on the Following Quarries (in all cases, where necessary, instructions have been given to ensure proper and safe working):—Anderson's (Blythwood Hill), Adelaide Brick Company (Burnside), Anstey's Hill, Adelaide Pottery Company's Clay (Teatree Gully), Brighton Cement, Badman's (Belair), Crafers Summit, J. Dunstan & Son, Dunstan Limited, Edwards' (Tapley's Hill), Elliott's Clay (Teatree Gully), Fuller & McElligott's (Brownhill Creek Road), Hardy's (Crafers), Harvey's (W. J.) and Harvey's (H. C.) (Yacka), Hannaford's (Teatree Gully), Klopper's (Anstey's Hill), Limestone (North-East Road), Lewcock's (Clare), Metropolitan Brick (Magill), Mitcham District Council, Metropolitan (Blackwood), McGlew & Co.'s Clay (Yatala), Nolan's (Clare), Pink's (Clare), Pink Freestone Company (Mount Lofty), Pocock's (Reynella), Railway (Sleep's Hill), Sheaoak (Sheaoak Hill), St. Peter's College (North-East Road), Sims' (Glen Osmond), Schwerkolt's (Sleep's Hill), Tesseire's (Salisbury), Wakefield's (Mount Lofty), Unley Corporation (Glen Osmond), Yatala.